CHAPTER 1

GENERAL INTRODUCTION

Preface

The *2007 World Drug Report* (United Nations Office on Drugs and Crime [UNODC], 2007) estimates that 3.8% of people from around the world (approximately 159 million people aged 15-64 years) use cannabis each year. There are large regional differences, with Oceania having the highest prevalence rate (15.8%), followed by North America (10.7%), Africa (7.7%), and West and Central Europe (7.4%), while Asia has the lowest rate of annual use, at 1.9% of the population (e.g., UNODC, 2007).

With reference to lifetime usage, approximately 34% of Australians over 14 years of age have used cannabis at some point in their lives (Australian Institute of Health and Welfare [AIHW], 2005). Corresponding figures for the United States of America (USA) and the United Kingdom (UK) are 40% and 30%, respectively (Substance Abuse and Mental Health Services Administration [SAMHSA], 2006; UK Focal Point on Drugs, 2005). It is estimated that 9% of people who have ever used cannabis will become dependent users (Anthony, Warner, & Kessler, 1994). On this basis, approximately 3-4% of the population in Australia, the USA and the UK are expected to experience issues related to cannabis dependency at some point in their lives. Australian data indicates that approximately 32% of current users meet criteria for a cannabis use disorder (dependence: 21%; abuse: 11%), compared to 36% of current users in the USA (Compton, Grant, Colliver, Glantz, & Stinson, 2004; Swift, Hall, & Teesson, 2001).

Cannabis dependency is thought to be closely related to daily consumption of the substance, with approximately half of all daily users qualifying for such a diagnosis (UNODC, 2006). About 10% of people who initiate cannabis use are estimated to become

daily users, while a further 20-30% become weekly users (Martin & Hall, 1998). The *2004 National Drug Strategy Household Survey* (AIHW, 2005) reported that approximately 2% of Australians used cannabis daily, representing 16% of those who had consumed the substance in the previous 12 months. This is slightly higher than daily usage rates in the USA (13%), and global estimates of 14% of those reporting use in the previous year (SAMHSA, 2006; UNODC, 2006).

Although the proportion of current users appears to be either stabilizing or declining in Australia, the UK and the USA, there is concern that the age at first use of cannabis is decreasing (AIHW, 2005; SAMHSA, 2006; UK Focal Point on Drugs, 2005). The average age at initiation of cannabis use is 14.9 years for 12-19 year old Australians whereas, for those who are over 20 years of age, the mean was 19.1 years (AIHW, 2005). Similarly, 12-21 year old Americans have an average age at initiation of cannabis use of 16.0 years, while it was 17.4 years on average for 12-49 year olds (SAMHSA, 2006). This trend is disturbing due to the growing body of research indicating that individuals initiating cannabis use during early to mid adolescence may be at a greater level of risk for experiencing adverse outcomes than individuals who start using the substance at a later point in their lives (e.g., Fergusson & Horwood, 1997).

Broadly speaking, the adverse outcomes or effects of use reportedly associated with cannabis consumption include dependence on the substance, the presence of psychopathology, deficits in cognitive functioning, physical health complications, and negative life circumstances (such as social, educational/occupational, or legal problems) (e.g., Grotenhermen, 2007). These adverse outcomes of use are typically illustrated in the literature as significant differences between users and non-users, or as increased levels of negative outcomes or effects of use associated with increased levels of cannabis use. However, this literature contains inconsistent and contradictory findings with regards to the nature of the association between cannabis use and these adverse outcomes; the likelihood of users

experiencing such outcomes; and the severity with which they are experienced. The literature is equally unclear about to the relative importance of the large number of risk factors that are reportedly associated with cannabis use and/or dependence. Thus, the current state of the literature makes it difficult to determine the actual harms and problems associated with cannabis use, and to identify individuals at risk of experiencing such harms and/or problems.

It should be noted here that, although the terms 'adverse outcomes' and 'adverse effects' imply a causal relationship, they are commonly used to describe an association where causality has not been ascertained, nor sometimes even assessed. To diminish the possibility of misinterpretation, the term 'adverse use-related issues' will be employed for the remainder of this thesis unless a causal relationship is intentionally implied.

There are a number of issues intrinsically entwined in the complexity of determining the actual harms and problems associated with cannabis use, and in identifying individuals at risk of experiencing these adverse outcomes and/or use-related issues. These limitations in the literature include:

1. The validity of dependence criteria and diagnoses of cannabis use disorders, and the tendency of researchers to employ dependence as a proxy for problematic or harmful use.

2. The assumption that more frequent use equates with more harmful or problematic patterns of use, and that frequency of use is an acceptable proxy for dose, with little or no consideration given to the quantity or quality (potency) of cannabis consumed.

3. The lack of investigation into other potentially important facets of cannabis use (e.g., motives for use, context of use, subjective experiences of intoxication) and the roles they may play in adverse outcomes and/or use-related issues.

4. The methodological differences between studies (e.g., sample populations, participant classification systems, variables assessed, outcome measures employed), the lack of statistical control for potential confounds (e.g., other substance use, pre-existing

psychopathology), and the tendency for authors to focus on significance levels without consideration of effect sizes.

5. The potential bias resulting from researchers having limited access to non-treatment-seeking or treatment-referred drug-using populations.

6. The lack of translation of findings regarding adverse use-related issues into meaningful discussions clarifying the 'real world' consequences in terms of an individual's ability to function in everyday life.

The issues outlined above will be discussed in more depth later in this and subsequent chapters. Nevertheless, it is important to reiterate that all of these issues have contributed to the current inability of researchers to state definitively: (a) the nature of the association between cannabis use and previously reported adverse use-related issues; (b) the likelihood of users experiencing these use-related issues; (c) the severity with which they are experienced; and, (d) the 'real word' impact of any adverse use-related issues on the ability of users to function in their daily lives. Additionally, a number of these issues have contributed to cannabis use being investigated in relative isolation, rather than being placed into appropriate context through the acknowledgement that it is just one aspect of an individual's life.

It is important that the lack of certainty evident in the current body of cannabis use-related literature is resolved so as to alleviate the current ambiguity regarding whether cannabis use is harmful, benign, or perhaps beneficial (the latter particularly in relation to medicinal use). It is also important to be able to identify individuals at increased risk of experiencing any adverse outcomes and use-related issues so that appropriately targeted preventative, early intervention, and harm minimization strategies can be delivered to both current and potential cannabis users. Ideally, such information would be incorporated into cannabis-related governmental policies, strategies, and legislation (e.g., health, education, policing) to ensure that future decisions are based on the actual, rather than imagined, harms

of the substance (Macleod et al., 2004) (for further information about the cannabis policy debate see: Ashton, 2002; Hall, 2001; MacCoun & Reuter, 2001; Wodek & Cooney, 2004).

Briefly, this thesis is organised as follows. The literature is reviewed and critically analysed in the present chapter, to give an overview of current knowledge on cannabis and its use. Specific areas of the literature are covered in greater depth in the introductory sections of later chapters. Chapter 2 describes the questionnaire and website used in this study, and the recruitment of participants. The demographic profile and current lifestyles of the participants are described in Chapter 3, while Chapter 4 covers their childhood lifestyles. Initiation of cannabis use is investigated in Chapter 5, the participants' current patterns of cannabis use are explored in Chapter 6, while heavy, prolonged and dependent use is investigated in Chapter 7. The participants' motives for using cannabis and their subjective experiences of acute cannabis use are explored in Chapter 8. Chapters 9 and 10 investigate the adverse use-related issues, with a focus on everyday psychopathological and cognitive functioning, respectively. Chapter 11 encompasses the development of a cannabis user typology, while Chapters 12 and 13 explore the differences and similarities evident for the cannabis user types in relation to lifestyle factors and everyday functioning, respectively. The final chapter, Chapter 14, contains a comprehensive discussion of issues raised in previous chapters and the findings and limitations of the present study, future directions are also suggested, and conclusions are drawn.

The literature review presented in this chapter consists of four major sections: Cannabis; Cannabis Users; Adverse Effects and Use-Related Issues; and, Issues Affecting the Determination of Cannabis Use-Related Harms and Problems. These sections are followed by a summary of the current state of the literate, with the final section of this chapter outlining the present study.

Cannabis

The term cannabis refers to products from the cannabis sativa, indica, or ruderalis plants. These products include: herbal cannabis, commonly referred to as 'marijuana' (i.e., leaf and heads/buds); cannabis resin, which is referred to as 'hashish'; and, cannabis oil (Ashton, 2001; Huestis et al., 2001; Pertwee, 2001; UNODC, 2006).

Cannabinoids

Cannabis contains over 400 chemicals, 70 of these are oxygen containing aromatic hydrocarbon compounds called cannabinoids, some of which are psychoactive (Ashton, 2001; Huestis et al., 2001; Pertwee, 2001; UNODC, 2006). The most potent of the psychoactive cannabinoids is delta-9-tetrahydrocannabinol (THC). Typically, THC leads to a 'high' (described below); with excessive doses inducing anxiety and psychotic-like symptoms in some users. The non-psychotropic precursor to THC, cannabidiol (CBD), is also thought to play an important role by moderating the effects of THC. That is, CBD appears to potentiate the depressant effects, and also antagonize the excitatory effects, of THC. Thus, CBD has a sedative effect; it also has antipsychotic, antianxiety, antinausea, and anticonvulsive properties (Frank, 1996; Mechoulam, Parker, & Gallily, 2002; UNODC, 2006; Zuardi, Crippa, Hallak, Moreira, & Guimaraes, 2006).

The THC/CBD ratio appears to be important in determining the acute effects of cannabis use, and potentially the impact of use on everyday psychological wellbeing (Frank, 1996; Hunt, Lenton, & Witton, 2006). These acute effects are described in more detail below, however, it is worth noting here that high THC/low CBD cannabis has been reported to result in an energised state, which is typically referred to as being 'high', while low-high THC/high CBD cannabis results in a more relaxed or 'stoned' state. Further, cannabis sativa generally has high levels of THC in comparison to CBD, while the reverse is true for cannabis indica (Frank, 1996).

Unfortunately, the CBD content of cannabis, and how it relates to effects of use, is an under-researched area, with studies examining cannabis potency being typically restricted to the investigation of THC (Hunt et al., 2006). Therefore, much of the following information is limited to discussion of THC.

The THC content of cannabis preparations can vary greatly, however cannabis oil has the highest level of THC (15-65% THC), followed by hashish (10-20%), then heads/buds (6-20%), with the leaves of the plant containing the least THC (4-8%) (Ashton, 2001; Huestis et al., 2001; Julien, 1998; Pertwee, 2001). The CBD content of cannabis can vary from almost none to as high as 95%, with the content in hashish reported to fluctuate from 1-62% (Frank, 1996).

Neuropsychopharmacology

Pharmacokinetics and Pharmacodynamics

When cannabis is smoked, approximately 25-50% of the THC is inhaled and absorbed rapidly across the membranes of the lungs, into the bloodstream. THC and other cannabinoids are then rapidly distributed throughout the body, including the brain (Ashton, 2001; Julien, 1998). The acute behavioural effects of cannabis use are related to rapidly rising levels of plasma THC; these effects are evident almost immediately. Users experience a 'high' after about 10 minutes, then the effects plateau for 2 or more hours, rarely persisting beyond 3-4 hours. Cannabis users may, however, titrate the dose they consume to maintain cannabis effects over longer periods of time (Ashton, 2001; Hammersley & Leon, 2006; Lukas, Mendelson, & Benedikt, 1995). CBD is thought to increase both the length of time to reach the 'high' and the duration of the plateau (Frank, 1996).

Acute Effects. This cannabis 'high' characteristically includes feelings of euphoria, relaxation and detachment, and increased sociability, as well as decreased feelings of anxiety, depression and tension. Impaired concentration and alertness may also occur. These effects

are thought to be dose-dependent, with heavy users reporting acquisition of tolerance (Ashton, 2001; Block, Erwin, Farinpour, & Braverman, 1998; Green, Kavanagh, & Young, 2003; Hammersley & Leon, 2006; Iversen, 2003; Lukas et al., 1995; Reilly, Didcott, Swift, & Hall, 1998).

The most commonly reported negative acute effects include anxiety-related (e.g., anxiety, paranoia, panic attacks) and cognitive effects (e.g., disorientation in time and space). Some users also report hallucinations, which may or may not be considered negative by users (Ashton, 2001; Block et al., 1998; Green et al., 2003; Hammersley & Leon, 2006; Reilly et al., 1998). Negative reactions appear to occur predominantly in drug naïve or anxious users, or those with probable psychological vulnerabilities (Ashton, 2001). Cannabis-induced subjective effects may differ greatly between individuals, over time in the same individual, and/or within a single session for an individual user (Green et al., 2003). Thus, THC is thought to induce mood amplifying effects in users, which are influenced by many variables, such as the context and setting of use, and individual factors including previous experience with the drug, personality factors, and personal expectancies (Block et al., 1998).

Neurobiology and Neurochemistry

Cannabis-induced effects are due to the interaction of THC and other cannabinoids with G-protein coupled endogenous cannabinoid (CB_1) receptors, which are ubiquitous in the brain. However, the non-psychotropic CBD appears to have a low affinity for CB_1 receptors. While THC acts principally as a neuromodulator, CBD is reported to be a high-potency antagonist of cannabinoid receptors. A broad range of specific brain structures contain CB_1 receptors including: the cerebral cortex (e.g., frontal lobe), hippocampus, amygdala and nucleus accumbens in the temporal lobe (i.e., the limbic system); and subcortical structures (e.g., substantia nigra in the midbrain, stratium in the basal ganglia, thalamus, cerebellum) (Ashton, 2001; D'Souza & Kosten, 2001; Glass, Dragunow, & Faull, 1997; Julien, 1998; Mechoulam, Peters, Murillo-Rodriguez, & Hanus, 2007).

CB_1 receptors are mainly located presynaptically within the neuronal lipid membranes. When THC binds to a CB_1 receptor, the cyclic nucletide second-messenger system is activated to inhibit adenylate cyclase. This prevents the activation of cyclic adenosine monophosphate (cAMP), which, in turn, inhibits calcium ion (Ca^{2+}) influx and facilitates potassium ion (K^+) flow. This process results in a reduction in gamma-amino-butyric acid (GABA) and dopamine uptake, and the inhibition of the release of monoamine neurotransmitters (Ashton, 2001; D'Souza & Kosten, 2001; Iversen, 2003; Pertwee, 2001).

High densities of CB_1 receptors are found in areas such as: the forebrain areas associated with high cognitive function; the forebrain, midbrain and hindbrain areas associated with the control of movement; and the hindbrain areas associated with the control of motor and sensory functions in the autonomic nervous system (Glass et al., 1997). Thus, THC-induced changes in brain function are thought to exert influence on cognition, perception, motor function, appetite, sleep, neuroprotection, neurodevelopment, and hormone release (D'Souza & Kosten, 2001). For example, the basal ganglia and cerebellum are involved in many forms of movement and postural control that are affected by cannabis use, and the effects of THC in the frontal lobe are thought to be responsible for the drug-induced 'high' (e.g., alterations in the experience of time, perceptual distortions) and the commonly reported cannabis-induced disruptions in concentration and attention. Additionally, learning, memory, mood, affect and emotion are all thought to be affected by cannabis use, due to the presence of CB_1 receptors in limbic areas, including the hippocampus and amygdala (Ashton, 2001; Glass et al., 1997; Julien, 1998).

Cannabis Users

Identifying Individuals at Risk

In an effort to determine which individuals are at greatest risk for cannabis use many studies have investigated a range of possible risk factors. A large number of these factors have been reported to be associated with cannabis use, although, a causal link between the variables and cannabis use has not been established. Further, there are a number of discrepancies in the literature, which may be due to differences in the measurement of cannabis use and psychosocial variables, inconsistent assessment of potentially confounding factors, or the impact of sample size on statistical significance calculations (Macleod et al., 2004). These issues will be discussed in more depth in Chapters 5 and 7 in relation to the initiation of cannabis use, and heavy, prolonged and dependent use (respectively) .

To summarise the literature, individuals who are at a higher level of risk for using cannabis have been reported to be young (e.g., Roeloffs, Wells, Ziedonis, Tang, & Unutzer, 2002) males (e.g., Coffey, Carlin, Lynskey, Li, & Patton, 2003) with lower levels of education (e.g., Fergusson, Horwood, & Beautrais, 2003) who smoke tobacco (e.g., Rey, Sawyer, Raphael, Patton, & Lynskey, 2002), engage in hazardous alcohol use (e.g., McGee, Williams, Poulton, & Moffitt, 2000), use other illicit drugs (e.g., Fergusson, Horwood, & Swain-Campbell, 2002), and display antisocial/delinquent behaviour (e.g., Coffey, Lynskey, Wolfe, & Patton, 2000).

In comparison to non-users, cannabis users are more likely to have a history of conduct disorder (e.g., Rey et al., 2002), depression (e.g., Lynskey et al., 2002) and social anxiety (e.g., Lynskey et al., 2002), and have engaged in suicidal behaviour in the past year (e.g., Rey et al., 2002). They are also more likely to have sensation-seeking personality traits (e.g., Palmgreen, Donohew, Lorch, Hoyle, & Stephenson, 2001), associate with peers who use cannabis (e.g., Coffey et al., 2000), and report low levels of parental attachment during

adolescence (e.g., McGee et al., 2000). Their parents are more likely to have permissive attitudes towards drug use and delinquency (e.g., Olsson et al., 2003), and there is often a family history of cannabis or other substance use (e.g., Hopfer, Stallings, Hewitt, & Crowley, 2003). In the family home, these individuals are more likely to have been exposed to parental conflict (e.g., Lynskey et al., 2002) and a socio-economically disadvantaged childhood (e.g., McGee et al., 2000), often belonging to a single-parent family (e.g., Rey et al., 2002) with a lower than average income (e.g., Gruber, Pope, Hudson, & Yurgelun-Todd, 2003).

Individuals who progress to cannabis dependency tend to fit the above description for cannabis users, and in comparison to non-dependent users, are more likely to be those who initiated cannabis use at a young age (e.g., Swift, Hall, Didcott, & Reilly, 1998) and had positive early experiences of cannabis use (e.g., Fergusson, Horwood, Lynskey, & Madden, 2003). Dependent users were also more likely to have left school early (e.g., Fergusson, Horwood, & Beautrais, 2003) and be currently single and unemployed (e.g., Teesson, Hall, Lynskey, & Degenhardt, 2000). Individuals at high risk of developing a dependence on cannabis are also more likely to have a history of sexual abuse than non-dependent users and non-users (e.g., Lynskey et al., 2002).

However, as noted above, there are a number of discrepancies in the literature. For example, some researchers not found significant associations between cannabis use and: gender (e.g., McGee et al., 2000); history of behavioural problems, such as conduct disorder or ADHD (e.g., McGee et al., 2000); tobacco use (e.g., Coffey et al., 2003); alcohol use (e.g., Swift, Copeland, & Hall, 1998); current use of other illicit drugs (e.g., Swift, Hall et al., 1998); persistent psychiatric morbidity (e.g., Coffey et al., 2003); internalizing disorders (King, Iacono, & McGue, 2004); family income, and parental employment and education levels (e.g., Rey et al., 2002); conflict in the family (e.g., McGee et al., 2000); and, poor parent-child interactions (e.g., McGee et al., 2000).

Even when these discrepancies are disregarded, it has been noted that the identification of possible risk factors has not had a noticeable impact in preventing or reducing cannabis use in Western societies (Macleod & Hickman, 2006). Additionally, in aiming to identify individuals at risk of cannabis use, there is an implicit assumption that all use will lead to abuse and/or dependence, and that all cannabis use is harmful (Duncan, White, & Nicholson, 2003). This assumption is likely to be at least partially due to the way in which cannabis users are recruited to studies; they are often convenience samples of individuals seeking treatment for use-related problems. Thus, if clinicians and researchers primarily have contact with individuals whose use is problematic, and lack knowledge of those with non-problematic use, their assumptions are likely to be skewed. For example, population-based studies indicate that a large number of people use cannabis without ever seeking treatment (Duncan et al., 2003).

Further, as cannabis use has become relatively normalized for young people in countries such as Australia, the USA and UK, many potential users do not fit the profile dictated by risk factors (i.e., dysfunctional and/or disadvantaged background, with delinquent/antisocial behaviour) (Miller & Plant, 2002; Parker, 2005). For example, in a cross-sectional study of 2,641 school students (aged 15-16 years), Miller and Plant (2002), found that 41% of the heavy cannabis users had good relationships with their parents, believed in obeying society's rules, and had low delinquency and aggression scores. The authors labeled this group 'ordinary', in contrast to their 'antisocial' and 'unhappy' cohorts, which accounted for 25% and 34% of heavy cannabis users in the study, respectively.

Describing Cannabis Users

Cannabis Use Classification Systems

The majority of cannabis-related research has described participants through the application of classification systems based on cannabis usage patterns, typically current

frequency of use, or lifetime usage. However, there are some problems with this approach, such as the difficulty encountered when trying to compare findings across the literature because of the different classification systems employed by researchers. For example, current use may be categorised as: 'not at all', 'once or twice' or 'three or more times' in the last 30 days (Rey et al., 2002); or as 'never used', '< weekly', 'at least weekly', or 'daily' (Patton et al., 2002). Therefore, an individual who uses cannabis three times a month may be categorised in either a low or high use category depending on the study in question.

Similar discrepancies are evident in the classification of participants in terms of lifetime use, which may be categorised, for example, as 'never used' or 'used at least once' (Rey et al., 2002), or an approximate number of uses over the lifetime (Roeloffs et al., 2002). Further complication results from the different labels assigned to cannabis use, such as: 'regular use', which may be defined as 'at least weekly' (Fried, Watkinson, James, & Gray, 2002; Swift, Copeland et al., 1998) or as '3-4 times per week' (Swift, Hall et al., 1998); 'heavy use', which may be defined as 'at least 3 occasions per week' (Lynskey et al., 2002) or '5 or more joints per week' (Fried et al., 2002); 'daily use', which may be defined as '5 or more times per week' (Patton et al., 2002); and 'non user', which may be defined as '<6 times in past 12 months' (Degenhardt, Hall, & Lynskey, 2001) or 'never used more than once per week and no use in last 2 weeks' (Fried et al., 2002).

Besides the difficulty in comparing research findings, there are a number of other problems relating to the usual methods of classifying cannabis users. First, as the effects of cannabiniods such as THC are considered to be dose-dependent (Ashton, 2001), classification systems which do not adequately distinguish between users who consume cannabis once a week, once a day, or multiple times a day, could be considered questionable. Second, issues of quantity and quality of cannabis used are routinely neglected, although these variables are integrally linked to dosage. Third, factors, such as context of use, method of administration, and reasons for use, are generally not taken into account, yet these factors

could reasonably be expected to impact upon effects of use (Block et al., 1998). Finally, individuals placed into each particular category may not be homogenous in relation to the variables that influence their use of cannabis, and the effects and use-related issues associated with such use.

Thus, the current cannabis classification systems typically used by researchers do not aid in understanding the complexities of cannabis use, nor do they necessarily predict or help explain differences between cannabis users.

Cannabis Users Typologies

A more recent approach to describing cannabis users is through the use of detailed typologies, which aim to increase understanding of cannabis use and cannabis users. For example, the United Nations Office on Drugs and Crime (UNODC, 2006) developed a typology for annual cannabis users to assist in understanding global cannabis demand, while the Canadian Senate Special Committee on Illegal Drugs (2002) developed a typology to aid in the identification of at-risk users, and to facilitate the provision of treatment for excessive cannabis users.

Typologies differ from simple classification systems in terms of the level of information used to categorise individuals, and therefore, the detail available to describe the different groups. For example, the UNODC user types were described in terms of frequency, quantity, and context of use, while, the Canadian Senate typology was more detailed, incorporating context of use, usage patterns, and history of cannabis use (Senate Special Committee on Illegal Drugs, 2002; UNODC, 2006). Hammersley and Leon (2006) developed a cannabis user typology based on context of use, and the frequency with which cannabis was bought and consumed by participants. In a different approach, Miller and Plant (2002) performed a cluster analysis (CA) on their heavy user group, which included data on factors such as: the quality of relationships with parents and friends, self-esteem, life satisfaction, depression, and delinquent and antisocial behaviour.

There is an obvious difficulty in comparing typologies from different researchers, as each is determined through the application of differing rationales, and based on different variables. However, as this is a relatively new way of exploring cannabis use, perhaps some consensus will appear in time. In any case, the advantage of using a typology, rather than simple categorisation, is the ability to take a larger number of factors into account. This leads to more detailed descriptions of users, which, for example, may enable greater understanding of the differences between individuals with similar usage levels, as is evident in Miller and Plant's (2002) findings in relation to heavy cannabis users. That is, Miller and Plant noted that the three types of heavy users identified in their study ('ordinary', 'antisocial', and 'unhappy'), represented individuals with different motivations for use, and that these groups used cannabis in different contexts.

Variables that Differentiate Users Types

The link between motivations for using cannabis and the context in which it is consumed is not surprising. That is, someone using to increase sociability is likely to use in a social context (i.e., with friends), while someone using to escape reality is more likely to use alone. As such, motivations for cannabis use are only alluded to in the Canadian Senate and UNODC typologies, through reference to the social context of use. However, both of these typologies go further in linking social contexts to the doses consumed by individuals. For example, 'casual users' were described by UNODC as using cannabis in social contexts on less than 12 occasions a year, where they would typically have 2 or 3 puffs on a joint shared among 3 or 4 people. While, the Canadian Senate's 'regular users' were described at using a few joints, a few times a month, in recreational and social contexts, mainly during the evening (Senate Special Committee on Illegal Drugs, 2002; UNODC, 2006).

Frequency of use has also been linked to motives for cannabis use, and to personality and psychopathological factors. For example, Brodbeck, Matter, Page and Moggi (2007) found that individuals with coping motives consumed cannabis more frequently than

individuals with social motives. Further, higher levels of hedonism were evident for those with social motives, while individuals with coping motives reported higher levels of psychopathology, mental health issues and psychosocial distress, and more negative life events (Brodbeck et al., 2007).

Subjective effects experienced by users have also been linked to the conditions under which cannabis is used, and the doses consumed (Block et al., 1998). As noted by Block et al., adequately documenting the subjective effects of cannabis use has been hindered by methodological inconsistencies in studies addressing this issue. These inconsistencies include the dimensions of the effects examined, individual differences, and the variability in the cannabis use factors examined. This view is supported in a recent review by Green et al. (2003), which determined that there was insufficient data examining the relationships between subjective effects and variables such as the subjects' age, history of cannabis use, or frequency of use. The authors concluded that there was a need for more rigorous research in this area, particularly with regards to the possibility of linking profiles of subjective cannabis use effects to individual factors, such as the personal characteristics of users, the social and physical context of use, the frequency and duration of cannabis use, and THC dose.

Furthermore, as noted by Hammersley and Leon (2006), there is little contemporary research evaluating the subjective effects of cannabis use despite significant changes in relation to the drug and its use in recent times (e.g., normalisation of use, greater accessibility, changing methods of cultivation, and the increased number of cannabis preparations and products available). Subjective effects of cannabis use and motives for use will be investigated in Chapter 8, while cannabis user typologies will be discussed in more detail in Chapter 11.

Adverse Effects and Use-Related Issues

As noted earlier, the adverse effects of cannabis and use-related issues include dependence on the substance, presence of psychopathology, deficits in cognitive functioning, physical health complications, and negative life circumstances (e.g., Grotenhermen, 2007). All of the above use-related issues will be discussed here except physical health, which is beyond the scope of this study: see Earleywine (2002), Grotenhermen (2007), Hall, Degenhardt, and Lynskey (2001), and Kalant (2004) for comprehensive reviews of cannabis-related physiological effects.

Cannabis Use Disorders

Types of Cannabis Use Disorders

Harmful Use and Abuse. According to the most recent version of the World Health Organization's *International Statistical Classification of Diseases and Related Health Problems* (ICD-10), a diagnosis of harmful use "… requires that actual damage should have been caused to the mental or physical health of the user….. There must be clear evidence that the substance use was responsible for (or substantially contributed to) physical or psychological harm…" (World Health Organization [WHO], 1993). Hence, a causal relationship must be demonstrated such that an individual's use of cannabis must be shown to be responsible for the harm/s experienced by the individual.

The American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM) does not have a diagnostic category that is directly equivalent to the ICD-10 harmful use classification; a diagnosis of substance abuse is the comparable category. The current version, DSM-IV-TR (American Psychiatric Association [APA], 2000), states that a diagnosis of substance abuse is appropriate if an individual meets one or more of four abuse criteria: failure to fulfill obligations; use in physically dangerous situations; use-related legal

problems; and, use despite social/interpersonal problems (see Table 1.1). Of these criteria, the first two relate to potential (but not necessarily actual) harm, while the last two are primarily related to actions by third-parties, which are (at least partially) outside of the individual's control. Thus, a diagnosis of substance abuse is actually quite dissimilar from a diagnosis of harmful use when considering the burden of evidence required in relation to actual harm/s experienced by an individual receiving such a classification.

Dependence. If an individual meets three or more of the seven DSM-IV dependence criteria, a diagnosis of dependence is made rather than one of substance abuse (APA, 2000). Similarly, an ICD-10 diagnosis of harmful substance use is only made if the individual does not meet the requisite number of criteria (three or more of six) for a diagnosis of dependence (WHO, 1993). This demonstrates that a diagnosis of dependence is considered more serious than either substance abuse or harmful use. Dependence is typically assessed in relation to a specific timeframe; most commonly, assessments are in relation to lifetime dependence or current/last year dependence.

It is important to note that none of the ICD-10 or DSM-IV dependence criteria (see Table 1.1) directly assess the harms of use, rather, they assess physiological effects of use (tolerance and withdrawal) or behaviours associated with use (strong desire to use, difficulty controlling use, increased time spent on use-related activities/decreased time spent on other activities, persistent use despite evidence of harm). Therefore, a diagnosis of dependence is not necessarily indicative of the presence of use-related harms. It has also been noted that, although these criteria seem to describe use-related problems, a diagnosis of cannabis dependence does not necessarily equate to problematic use of the substance (Alexander, 2003; Swift, Hall et al., 1998).

Table 1.1

DSM-IV and ICD-10 Diagnostic Guidelines for Cannabis Dependence and Abuse/Harmful Use

DSM-IV Diagnostic Guidelines	ICD-10 Diagnostic Guidelines
Dependence – must meet at least three of seven criteria	**Dependence** – must meet at least three of six criteria
▪ Tolerance to effects of cannabis	▪ Tolerance to effects of cannabis
▪ Withdrawal symptoms experienced, or continued use to avoid such symptoms	▪ Withdrawal symptoms experienced, or continued use to avoid such symptoms
▪ Larger amounts used than intended or cannabis used for longer than intended	▪ Difficulty controlling use in relation to onset, termination, or levels of use
▪ Persistent desire or unsuccessful attempts to decrease/cease use	▪ Strong desire or compulsion to use
▪ Large amount of time spent on obtaining cannabis, using it and recovering from acute effects of use	▪ Neglect of alternative pleasures or interests because of use, increased amount of time necessary to obtain or take the substance, or to recover from its effects
▪ Use-related reduction in time spent on other important activities (e.g. social, occupational, recreational)	
▪ Continued use despite experiencing use-related psychological or physical problems	▪ Persisting with use despite clear evidence of overtly harmful consequences
Abuse – must meet at least one of four criteria (only endorsed if not meeting dependence diagnosis)	**Harmful Use** – Must be clear evidence that actual damage has been caused in relation to physical or psychological health (not endorsed if diagnosed with dependence)
▪ Use in physically dangerous situations (e.g. driving)	
▪ Recurrent cannabis-related legal problems	
▪ Continued use despite experiencing related social or interpersonal problems	
▪ Failure to fulfill major obligations (e.g. work/home activities)	

Prevalence

Population level data, gained from national studies in Australia and the USA, indicate that 2.2% and 1.5% of adults (respectively) meet DSM-IV criteria for a diagnosis of cannabis use disorder, while 1.7% Australian adults meet ICD-10 cannabis use disorder criteria (Compton et al., 2004; Swift et al., 2001). When only current users are examined, these figures are 31.7%, 35.6%, and 23.6%, respectively.

Interestingly, the Australian data is based on one sample population; the difference between the percentage of these adults meeting the DSM-IV and ICD-10 cannabis use disorder criteria is primarily due to the divergence evident in the criteria for DSM-IV cannabis abuse and ICD-10 harmful use. With reference to the current users, where 10.7% meet criteria for DSM-IV cannabis abuse, only 1.5% meets ICD-10 harmful use criteria. In contrast, the dependence criteria for both the DSM-IV and ICD-10 appear to be highly comparable, with 21% and 22% meeting the respective dependence criteria (Swift et al., 2001).

Approximately 9% of people who try cannabis are thought to qualify for a diagnosis of dependence at some point (Anthony et al., 1994). This appears to become an issue fairly early in individuals' use careers, with 4% of all cannabis users estimated to become dependent within 1-2 years of initiating use (Chen et al., 2005), and all individuals who develop cannabis dependence usually doing so within the first 10 years of use (Anthony et al., 1994). The cannabis use variable most commonly associated with dependence is the frequency with which it is consumed; it is believed that daily use is most likely to lead to dependence. Since an estimated 10% of people who try cannabis progress to daily use (Martin & Hall, 1998), it could be assumed that the vast majority of daily users will meet dependency criteria. However, it has been reported that only about half of all daily users meet DSM or ICD dependence criteria (UNODC, 2006), therefore it is likely that some non-daily users experience cannabis dependence.

This seems to be evident in a study of 200 Australian urban, long-term, regular cannabis users, where 56% were daily users, but 72% of all participants met ICD-10 criteria for dependence in the previous 12 months (Swift, Copeland et al., 1998). Similarly, when 162 of these participants were followed-up a year later, 51% were using cannabis daily and 62% of the entire sample qualified for an ICD-10 diagnosis of dependence in the last year (Swift, Hall, & Copeland, 2000). However, a study of 243 Australian rural, long-term, regular cannabis users found that while 65% were daily users, only 57% of the entire sample met ICD-10 criteria for dependence in the past 12 months (Swift, Hall et al., 1998). These two Australian samples also differed substantially in relation to rates of lifetime dependence, with 92% of the urban sample meeting DSM-III-R criteria for lifetime cannabis dependence, in comparison to just 57% of the rural sample. Thus, while not all of the daily users in the rural sample met criteria for last year or lifetime dependence, presumably all of the urban daily users and many of the urban non-daily users met these criteria. It is evident from these research findings that daily cannabis use does not necessarily equate to dependence on the substance, and non-daily use does not necessarily equate to a lack of dependency. It is also apparent that factors beyond frequency of use must play a role in the development of dependency.

Factors Associated with Dependence

Demographic Factors. There are a number of demographic factors that are reportedly associated with cannabis dependence. For example, the cannabis use literature tends to indicate that males are more likely than females to become dependant users (e.g., Chen, O'Brian, & Anthony, 2005), and higher rates of dependence have also been linked to younger users (e.g., Looby & Earleywine, 2007). Other demographic factors that have been found to be associated with cannabis dependence include having less education (e.g., Fergusson, Horwood, & Beautrais, 2003), being single, and being unemployed (e.g., Teesson et al., 2000).

Interestingly, the two Australian samples discussed above differed substantially on two of these factors: age and education. The rural sample was older on average (*M* = 36 years, *SD* = 7.5) than the baseline urban sample (*M* = 28 years, *SD* = 7.5), while the urban sample was more educated than the rural sample, with 60% and 45%, respectively, having attained post school qualifications. It should be noted that these figures go against expectations since lower levels of education were not typical in either the rural or urban samples; and the more educated participants were also those with the higher rates of cannabis dependence. Similarly, in contrast to trends noted in the literature, the majority of individuals in the two Australian samples were in relationships (rural: 64%; urban baseline: 59%; urban follow-up: 63%) and employed (rural: 56%; urban baseline: 56%; urban follow-up: 70%) (Swift, Copeland et al., 1998; Swift et al., 2000; Swift, Hall et al., 1998). Additionally, gender was not a point of difference between the samples, with males accounting for 58% of both the rural and baseline urban samples, dropping to 53% at follow-up in the urban sample. Therefore, of the demographic factors, only age difference appears to explain at least some of the difference in dependency rates across the two samples.

Use-Related Factors. Of the use-related factors reportedly associated with cannabis dependence, earlier onset of use (i.e., specifically before late adolescence) has perhaps been the most consistent factor. For example, Fergusson and Horwood (1997) found that 77% of individuals who had used cannabis 10 or more times by 15-16 years of age met criteria for a cannabis use disorder when followed-up at 16-18 years of age. Consistent with this is the clinical profile of treatment-seeking users assessed by Copeland, Swift and Rees (2001). For this sample, the median age of cannabis initiation was 15 years (range: 7-23 years), with progression to regular (weekly) use 3 years later on average (median = 18 years; range = 12-30).

The cannabis dependence literature relies heavily on frequency of use as a proxy measure of the actual quantity of cannabis consumed. Unfortunately, there is little data available in the literature directly assessing the relationship between dependency rates and quantity of cannabis consumed by users. Looby and Earleywine (2007) reported that dependent users in their study consumed significantly more joints each week (M =16.6; SD = 15.2) than nondependent participants (M =14.1; SD = 13.6), however, the effect size was very small (r = .082). Chen, Kandel and Davies (1997) also found that the quantity of cannabis consumed (joints/day) was significantly associated with dependence, yet, they noted that frequency of use was more strongly associated with dependence than the quantity of joints consumed. Nevertheless, Chen et al. (1997) reported that rates of dependence increased significantly from consumption of 2 to 3 joints per day for adult males, and for 1 to 2 joints per day for adult females

Although there has been little investigation evident in the literature, it is also probable that the quality (or potency) of the cannabis consumed and the method by which it is administered are associated with dependence. For example, 93% of the treatment-seeking sample assessed by Copeland et al. (2001) preferentially consumed the heads/buds of the cannabis plant, while 74% used bongs. Further, bong users have been found to be significantly more likely to be dependent than joint smokers (Chabrol, Roura, & Armitage, 2003). However, Chabrol et al. noted that, while bong use may contribute to cannabis dependence, it is also possible that dependence may lead to using stronger methods of administration, such as bongs.

Strikingly, these use-related factors are points of clear differentiation between the two Australian samples of cannabis users discussed above. That is, while the rural sample was 17 years of age on average when they first used cannabis, the urban sample tended to be two years younger, with an average age of 15 years at first use. Therefore, a larger proportion of the urban sample was using cannabis by Fergusson and Horwood's (1997) high risk age of

15-16 years. Interestingly, both groups progressed to regular use (at least weekly use) 2 years later, on average, which was slightly faster than the 3 years reported for Copeland et al.'s (2001) treatment-seeking users.

Further, the Australian rural sample consumed a median of 2 joints per day (range: 0.2-40), while the urban sample consumed a median of 6 cones (range: 0.1-50) per day at baseline, and an average of 6.7 cones (range: 0.1-30) per day at follow-up. Thus a higher proportion of urban users consumed cannabis at more risky levels, when assessed in accordance with Chen et al.'s (1997) findings. Additionally, a higher percentage of the urban users (baseline: 93%; follow-up: 91%) consumed heads/buds of the cannabis plant than the rural sample (78%), and the vast majority of the urban sample (83%) used bongs, whereas only 18% of the rural sample did so (Reilly et al., 1998; Swift, Copeland et al., 1998; Swift et al., 2000; Swift, Hall et al., 1998). In summary, the Australian urban sample had higher dependency levels than the rural sample, initiated cannabis use at a younger age, and used bongs to consume greater quantities of higher potency cannabis, relative to older, rural participants who tended to smoke joints.

Cannabis Disorder Criteria. The DSM and ICD cannabis disorder criteria may also play a role in increasing the likelihood of some users receiving a diagnosis, while others, with similar usage patterns, do not. Degenhardt, Lynskey, Coffey, and Patton (2002) investigated this issue in relation to 'diagnostic orphans'. This term describes users who meet none of the abuse criteria but meet one or two dependence criteria. Thus, although they show indications of cannabis dependence, they do not actually qualify for a diagnosis of abuse or dependence. The patterns of cannabis use reported by the diagnostic orphans identified in Degenhardt et al.'s study were generally similar to those of the participants that were diagnosed with cannabis abuse. For example, they met an average of 1.4 (SD = 0.5) and 1.2 (SD = 0.8) dependence criteria (respectively), with 31% of diagnostic orphans and 38% of those meeting abuse criteria engaging in daily cannabis use. These levels were significantly higher than those

for non-problematic users (0 dependence criteria, as per group description; 1% daily users) and lower than those for participants diagnosed with cannabis dependence (*M* = 4.3 dependence criteria; *SD* = 1.1; 72% daily users) (Degenhardt et al., 2002).

A more specific example of the impact of diagnostic criteria is illustrated in relation to dependence criterion covering the amount of time spent on use-related activities. As cannabis is an illegal substance, the amount of time spent obtaining it is likely to be substantial unless one grow one's own (Dunlap, Benoit, Sifaneck, & Johnson, 2006). With reference to the two Australian samples, the nature of this criterion may have led to a greater proportion of urban users being classified as dependent simply because of a difference in supply source. That is, only 19% of the urban sample grew at least some of their own cannabis, and 61% met the dependence criterion; in comparison, 66% of the rural sample grew their own cannabis, and only 42% met the dependence criterion (Swift, Copeland et al., 1998; Swift, Hall et al., 1998).

Earleywine (2002) provides a number of further examples of possible situations which could lead to diagnostic false positives and negatives for each of the dependence and abuse criteria. He notes that, due to the role of clinical interpretation in the DSM and ICD guidelines, the accuracy of any diagnosis is dependant on the ability of the clinician. It is further highlighted that such diagnoses may be more indicative of the clinician's values and culture than of the adverse outcomes of use or associated use-related issues experienced by the individual being assessed (Earleywine, 2002).

Concern has also been expressed in relation to the ability of individuals, especially teenagers, to correctly assess their symptoms and understand the DSM and ICD dependence criteria-related questions. For example, Chen et al. (1997) found that three or more dependence criteria were met by 14% of adolescents who had used cannabis less than 12 times in the previous year. Perhaps more worrying is a finding by Chen and Anthony (2003)

that dependence criteria were endorsed by both adolescents and adults who had used cannabis only once or twice in their lifetime.

Further criticisms of the DSM and ICD guidelines for assessing cannabis dependence include the necessity to meet only three of the six (ICD-10) or seven (DSM-IV) criteria, and that all of the criteria are weighted equally (Budney, 2006; Dunlap et al., 2006). Because of these diagnostic frameworks, a diagnosis of dependence does not actually provide any specific information regarding the exact nature of the problems or issues experienced by an individual; there are a multitude of possible combinations of three or more criteria. Moreover, an individual may be diagnosed as being dependent on cannabis without having any symptoms of a physiological dependence, that is without developing a tolerance to the effects of cannabis, and without experiencing withdrawal symptoms on reducing use, or continuing to use to avoid such symptoms (Earleywine, 2002).

Although, it has been suggested that the classification of individuals into dependent or non-dependent categories may be useful in treatment settings, it is important to note that a diagnosis of cannabis dependence does not necessarily equate to problematic use of the substance. While 57% of the Australian rural sample and 72% of the urban sample met ICD-10 dependence criteria, only 23% and 33%, respectively, believed that their cannabis use was a problem. Thus, a diagnosis of dependence does not necessarily indicate the impact that cannabis use has an on individual's ability to function in their day-to-day life (Alexander, 2003; Swift, Copeland et al., 1998; Swift, Hall et al., 1998).

Cannabis Use and Psychological Wellbeing

It is generally accepted that cannabis use can exacerbate pre-existing mental health disorders, such as psychosis and schizophrenia (Johns, 2001). Cannabis use and/or dependence is also reportedly associated with other mental health problems including: depression (e.g., Kelder et al., 2001); anxiety (e.g., Patton et al., 2002); suicidality (e.g.,

Beautrais, Joyce, & Mulder, 1999); other drug and alcohol use problems (e.g., Rey et al., 2002); and, conduct problems (e.g., Lynskey et al., 2002). However, the direction and existence of causal relationships between cannabis use and mental health problems remains a highly contentious issue. Some of the key issues and evidence are presented below, with an extended review and discussion of relevant literature included in Chapter 9.

For a long time, it was proposed that individuals with mental health disorders and concomitant cannabis use were simply 'self-medicating'. However, this theory has recently been challenged by the results of a number of longitudinal studies indicating that cannabis use may actually induce mental health problems such as psychosis (e.g., Fergusson, Horwood, & Ridder, 2005) and depression (e.g., Bovasso, 2001; Brook, Brook, Zhang, Cohen, & Whiteman, 2002).

Schizophrenia and Other Psychoses

A New Zealand longitudinal study indicated that daily cannabis users were 1.6-1.8 times more likely to experience psychotic symptoms than non-users (Fergusson et al., 2005). While this does not represent a large difference between the groups, after controlling for confounding factors, cannabis use was found to be the best predictor of later psychotic symptoms. This finding is supported by those of Bailey and Swallow (2004), Dumas et al. (2002), and Mass, Bardong, Kindl and Dahme (2001) among others, who found that cannabis users reported more schizotypal symptoms than non-users.

Similarly, a recent systematic review of longitudinal population studies by Moore et al. (2007) found that there was a consistent association between cannabis use and increased levels of psychotic symptoms across studies, although this does not necessarily indicate causality. The authors stated that: "The evidence is consistent with the view that cannabis increases risk of psychotic outcomes independently of confounding and transient intoxication effects" (p319). However, it has been noted by a number of authors (e.g., Macleod et al., 2004) that although population level estimates of cannabis use have increase

dramatically since the 1970's, incidence rates of schizophrenia have not increased. This provides support for the predisposition/vulnerability model, which proposes that cannabis use triggers psychological disorders in individuals with an underlying vulnerability or predisposition for that disorder. That is, the incidence rates for psychosis do not change, but perhaps just the proportion of individuals for whom their psychosis is triggered by cannabis, as opposed to some other type of stressor (Hunt et al., 2006; Teesson, Degenhardt, Proudfoot, Hall, & Lynskey, 2005).

The psychosis vulnerability model is supported by Caspi et al.'s (2005) finding of a gene by environment interaction in their study. The authors found that the interaction between a functional polymorphism in the catechol-O-methyltransferase (COMT) gene and adolescent-onset cannabis increased the risk of experiencing schizophreniform disorder and psychotic symptoms in adulthood. For example, cannabis users with two affected alleles were at the highest level of risk for developing schizophreniform disorder in adulthood (Odds Ratio [OR] = 10.9), followed by those with only one affected allele (OR = 2.5), while individuals carrying two unaffected genes had a low level of risk (OR = 1.1). It is also possible that genes play a role in explaining why some people with schizophrenia are not negatively affected by their cannabis use, as suggested in a recent study by Coulston, Perdices, and Tennant (2007). These authors noted that "there exists a subgroup of the schizophrenia population who do not experience exacerbation of positive symptoms when using cannabis, and/or who experience antipsychotic efficacy and amelioration of the negative symptoms when using cannabis" (pg. 13).

Depression and Anxiety

Links between cannabis use and depression have been studied by many researchers, although the relationship with anxiety has received significantly less investigation, despite the high level of comorbidity of anxiety and depression (e.g., Sartorius, Ustun, Lecrubier, &

Wittchen, 1996), the existence of anxiety-related acute effects of cannabis use (e.g., Ashton, 2001), and the reported antianxiety effects of cannabis (e.g., Sethi et al., 1986).

The relationship between cannabis use and depression lacks clarity, however, cross-sectional studies often show a significant association between cannabis use and levels of depression symptomology (e.g., Rey et al., 2002). Similarly, a review by Degenhardt, Hall and Lynskey (2003) indicated that there was a modest association between depression and heavy or problematic cannabis use (particularly for individuals with early-onset of use). However, the latter review found little evidence of an association between depression and infrequent cannabis use. More recently, Macleod et al. (2004) and Moore et al. (2007) both undertook systematic reviews of longitudinal general population studies that related to the relationship between cannabis use and affective symptomatology. While, Macleod et al. (2004) reported that associations between cannabis use and depression were lacking in consistency, Moore et al. (2007) noted that almost all of the studies they reviewed indicated that cannabis users were at an increased level of risk for experiencing affective outcomes. Macleod et al. concluded that currently the evidence is not strong enough to support the view that cannabis use in itself harms people psychologically. Moore et al. also concluded that the evidence was not strong enough to suggest a causal relationship between the variables, but they noted that the association was strong enough to be of concern.

Both Macleod et al. (2004) and Moore et al. (2007) agreed that the strength of the associations between cannabis use and affective symptomatology were reduced, and sometimes fully attenuated, after adjustment for potential confounds. This provides some support for Degenhardt, Hall, and Lynskey's (2001) finding that after adjusting for demographics, neuroticism, and other drug use, cannabis use was not related to reports of affective or anxiety disorders. Further, Degenhardt et al. (2003) state that because researchers often fail to statistically control potentially confounding variables, previously reported relationships between depression and cannabis use may have been due to common risk

factors, which were either overlooked or not controlled for appropriately in past studies. This is pertinent because both substance use and psychopathology share common antecedents, such as childhood adversity. Hence, rather than cannabis use causing later psychopathology, cannabis use and psychopathology may both be outcomes of adverse life circumstances (Macleod et al., 2004).

Moreover, recent investigations into medicinal cannabis use leads back to the self-medication hypothesis. For example, 22% of 2969 medicinal users in the UK reported that they were self-medicating for depression (Ware, Adams, & Guy, 2005), while in an Australian study of medicinal users, 56% of the participants who were experiencing depression reported using cannabis to relieve their symptoms (Swift, Gates, & Dillon, 2005). In the latter study, 99% of participants who were using to increase their ability to cope emotionally found that the effects of cannabis use were a good or great relief. Further, 30% reported the return of depression or anxiety after ceasing cannabis use.

Cannabis Use and Cognitive Function

Many studies have examined the association between cannabis use and different aspects of cognitive function, including acute and residual effects. However, this body of research contains a number of inconsistent findings. An underlying methodological issue, which may have contributed to the lack of clarity in the literature, is the often small sample sizes involved in these studies. That is, a lack of statistical power when calculating the significance of relationships, and the lack of attention paid to effect sizes, may have led researchers to discount potentially important findings. This possibility will be examined in Chapter 10, with a specific focus on the subset of the cannabis-cognition literature that is most relevant to the present study; that is, cognitive failures and everyday and prospective memory.

Reported negative cognitive effects associated with cannabis use include: impairments in immediate, delayed and short-term visual memory (e.g., Simon & Mattick, 2002); deficits in explicit and episodic memory (e.g., Curran, Brignell, Fletcher, Middleton, & Henry, 2002); impaired recall of word lists (e.g., Pope, Gruber, Hudson, Huestis, & Yurgelun-Todd, 2002), generalized memory deficits with impairment of learning, retention and retrieval (e.g., Curran et al., 2002); impairment in verbal memory (e.g., Rodgers, 2000); reduced information processing speed (e.g., Struve, Patrick, Straumanis, Fitz-Gerald, & Manno, 1998); impaired selective attention (e.g., Solowij, Michie, & Fox, 1995); significant differences between verbal and performance IQ (e.g., Payne, 2000); declines in measured IQ (e.g., Fried et al., 2002); less effective visual processing (e.g., Huestegge, Radach, Kunert, & Heller, 2002); impaired executive functioning (e.g., Bolla, Brown, Eldreth, Tate, & Cadet, 2002); decreased psychomotor speed and manual dexterity (e.g., Bolla et al., 2002); impaired time estimation (e.g., Solowij et al., 2002); and impaired visuo-perception (e.g., Bolla et al., 2002). However, other researchers report no significant association between cannabis use and: implicit and working memory (e.g., Curran et al., 2002); visual memory (e.g., Rodgers, 2000); perceptual priming (e.g., Curran et al., 2002); visual, auditory and complex reaction times (e.g., Bolla et al., 2002); attention and concentration (e.g., Rodgers, 2000); processing of elementary stimuli by the auditory pathways (e.g., Mulheran, Middleton, & Henry, 2002); cognitive decline (e.g., Lyketsos, Garrett, Liang, & Anthony, 1999); and, executive functioning (e.g., Payne, 2000). Moreover, a recent meta-analysis of data from 15 studies on residual cognitive effects of THC consumption found that the ability of chronic users to learn and remember new information may be affected, but other cognitive functions (i.e., simple reaction time, attention, executive functioning, perceptual motor, simple motor, and verbal/language skills) appeared unaffected (Grant, Gonzalez, Carey, Natarajan, & Wolfson, 2003).

Solowij et al. (2002) suggested that inconsistent findings regarding the effects of cannabis use on different aspects of cognitive function may be due to methodological differences between the studies. Similarly, after reviewing the available research, Gonzalez, Carey and Grant (2002) observed that these methodological limitations precluded any definitive conclusions being reached about the neuropsychological effects of cannabis use. For example, Grant et al. (2003) reported that only 11 out of 1,014 studies reviewed met current basic research standards. Thus, a range of methodological issues, such as discrepancies between studies, has resulted in little agreement in the cognitive-effects literature.

Cognition and Psychopathology

Impaired cognitive functioning is typically evident in people experiencing psychotic symptoms/disorders (e.g., schizotypy, schizophrenia, psychosis) and also in people with mood disorders (Kraus & Keefe, 2007; Spitznagel & Suhr, 2004). For depression, this includes impaired learning, memory, and executive functioning (Austin, Mitchell, & Goodwin, 2001). Similarly, deficits in the areas of attention, memory, and executive functioning are common in schizophrenia, and are often displayed as performance up to two standard deviations below the mean (Keefe & Hawkins, 2005). Further, there is a high level of comorbidity between psychotic symptoms/disorders and mood disorders (Liraud & Verdoux, 2002; Spitznagel & Suhr, 2004), and, as noted above, substantial overlap between these disorders and cannabis use.

Cannabis use is typically viewed as an activity that exacerbates psychotic symptoms in affected individuals. Thus, it would not be surprising if cannabis use increased the amount of cognitive impairment experienced by individuals with schizophrenia. In line with this, D'Souza et al. (2005) found that the participants with schizophrenia who received a 2.5 mg or 5 mg dose of THC performed significantly worse on learning and immediate and delayed

recall tasks than the participants receiving a placebo. Yet, there were no significant group differences evident for tasks assessing distractibility, vigilance, or verbal fluency.

Inconsistent effects were also reported by Coulston et al. (2007) for a study investigating neuropsychological performance in cannabis users and nonusers who were diagnosed with schizophrenia. Participants with a current cannabis use disorder tended to perform worse on a task assessing immediate memory than those without a cannabis use disorder. However, cannabis use was associated with better performance on tasks within the attention/ processing speed and executive function domains. Similar results have been reported by other researchers (e.g., Stirling, Lewis, Hopkins, & White, 2005; Wobrock et al., 2005), including Potvin, Joyal, Pelletier and Stip (2007), who conducted a meta-analysis of 23 studies with 1807 participants diagnosed with schizophrenia. Potvin et al. found that cannabis-using schizophrenia patients performed significantly better than nonusers on tasks assessing problem solving, reasoning, and verbal memory. Thus, the authors proposed that a subgroup, composed primarily of young, male cannabis users, may have better social and cognitive skills than typical schizophrenia patients.

Deficits in cognitive functioning have been linked to decreased levels of neurotransmitters, such as acetylcholine, noradrenaline, glutamate, dopamine, serotonin, and GABA, in the prefrontal cortex (Coulston et al., 2007). However, Coulston et al. (2007) posited that cannabis use, or more specifically, the agonist effects of cannabiniods on cannabiniod receptors in the prefrontal cortex, may stimulate increases in neurotransmitters such as acetylcholine, noradrenaline, and glutamate. Further, as mentioned previously, one of the outcomes of THC binding to CB_1 receptors is the reduced uptake of GABA and dopamine (Ashton, 2001; D'Souza & Kosten, 2001; Iversen, 2003; Pertwee, 2001). Thus, cannabis use acts to increase prefrontal neurotransmission, which results in the enhanced cortical processing that is essential for higher-order cognitive functions, such those within the executive functioning and attention/processing speed domains (Coulston et al., 2007).

Interestingly, hypodopaminergic activity in the prefrontal cortex has been linked to negative schizotypy, while positive schizotypy is thought to be associated with hyperdopaminergic activity (Dinn, Harris, Aycicegi, Greene, & Andover, 2002). In line with this, deficits in prefrontal cognitive functions, such as impaired executive functioning, have been found to be associated with negative, but not positive, schizotypy (Dinn et al., 2002). Further, Spitznagel and Suhr (2004) found that schizotypal participants with high levels of depression demonstrated better cognitive performance than non-depressed schizotypal participants. The authors, on examining that nature of differences between the two groups, identified the former group as reporting substantially higher numbers of suspiciousness/ paranoid symptoms; these symptoms are features of positive schizotypy.

Therefore, it seems that due to low levels of prefrontal neurotransmission, individuals experiencing predominantly negative psychotic symptomatology (e.g. flat affect, avolition) are likely to experience impaired cognitive functioning in the prefrontal cortex (e.g. attention, memory, and executive functioning). When these individuals use cannabis, the neuropharmacological effects result in increased prefrontal neurotransmission, thus improving cognitive functioning. Conversely, prefrontal neurotransmission appears to be too high in individuals with predominantly positive psychotic symptomatology (e.g. hallucinations, delusions). This means that their cognitive functioning in the prefrontal cortex does not appear to be impaired. Thus, an increase in neurotransmission in this region of the brain, resulting from cannabis use, might lead to increased positive symptomatology; that is, an exacerbation of their psychoses. So, with reference to cognitive functioning, cannabis use is likely to be beneficial for individuals with negative psychotic symptomatology, while being detrimental for those with positive psychotic symptomatology.

Issues Affecting the Determination of Cannabis Use-Related Harms and Problems

As noted in the Preface, at the beginning of this chapter, there are a number of methodological shortcoming that contribute to our current difficulty in elucidating cannabis-related harms and problems experienced by users. These issues have contributed to the inability of researchers to state definitively: (a) the nature of associations between cannabis use and previously reported adverse use-related issues; (b) the likelihood of users experiencing these use-related issues; (c) the severity with which they are experienced; and, (d) the 'real word' impact of any adverse use-related issues on the ability of users to function in their daily lives. Further, with a lack of acknowledgement in the literature that cannabis use is just one aspect of an individual's life, little is known about the overall context of such use.

Relationship between Dependence, Harms, and Problems

One of these issues is the tendency of researchers to employ dependence as a proxy measure of problematic or harmful use. As previously outlined, this is troublesome because: (a) the dependence criteria are not necessarily associated with actual harms to individual users; (b) a diagnosis of cannabis dependence does not necessarily equate to problematic use of the substance; and, (c) a diagnosis of dependence does not indicate the impact that cannabis use has an on individual's ability to function in their day-to-day life (Alexander, 2003; Swift, Hall et al., 1998). Further, as alluded to above, there is increasing recognition that the usual methods of assessing cannabis dependency, such as DSM and ICD criteria, may not be valid due to the nature of requisite criteria (e.g., Dunlap et al., 2006).

While problematic cannabis use is referred to in the literature, neither ICD-10 nor DSM-IV-TR has a corresponding diagnostic category. It is posited here that determination of problematic cannabis use must be based on evidence that an individual's use of cannabis is

associated (directly or indirectly) with problems experienced by the individual. Thus, problematic use differs from harmful use on the basis of the nature of the relationship with cannabis use: the former, an association; the latter, causal. While problematic use relates primarily to adverse use-related issues, it may well be implicit in use-related harms, namely adverse outcomes or effects of use. As the present study employed a cross-sectional design, it will focus on the problematic use of cannabis; that is, associations between cannabis use and adverse use-related issues. These problems might take many forms (e.g., psychological, physiological, social), however, in the present study, problematic use will refer to patterns of cannabis use that are associated with impairment in an individual's ability to function in day-to-day life, with a specific focus on psychopathology and cognitive functioning.

Frequency of Use as a Variable

The ways in which researchers employ frequency of cannabis use as a variable contribute to the difficulty in ascertaining cannabis-related harms and problems experienced by users. Specifically, this aspect of cannabis use is commonly utilised in the classification of users; with more frequent use considered to equate to more harmful or problematic patterns of use. However, there are indications in the literature that individuals who use cannabis frequently are not an homogenous group, with only some engaging in use that could, plausibly, be defined as problematic (e.g., Hammersley & Leon, 2006; Miller & Plant, 2002).

Further, there is an implicit assumption that frequency of use can be employed as a substitute for dose, with little or no consideration given to the quantity or quality (potency) of cannabis consumed (Chen et al., 1997). There is evidence that it is the quantity of cannabis used rather than the frequency with which it is used that is most strongly associated with cannabis use disorders (Grant & Pickering, 1998; Swift, Hall et al., 1998).

Moreover, since frequency of use (either in terms of current frequency or cumulative lifetime usage [frequency x years of use]) is the primary focus of researchers investigating adverse use-related issues, scant attention has been paid to other potentially important facets

of use. Aspects of cannabis use that may have an impact on adverse use-related issues include the social and physical context of use, methods of administration, individual differences in the subjective effects of cannabis intoxication, and motivations for using cannabis (e.g., Chabrol et al., 2003; Green et al., 2003). For example, there is evidence that differing motives for cannabis use may be associated with different use-related issues, such that the reasons an individual uses cannabis may be more important than simply the frequency with which it is consumed (Brodbeck et al., 2007).

Methodological Issues and Confounding

Methodological differences between studies and potential confounding are also issues contributing to the lack of clarity in the literature concerning the harms and problems associated with cannabis use. For example, Macleod et al. noted that it was not possible to complete a meta-analysis exploring the relationships between cannabis use and psychological and social issues because: "although some measures were similar across studies, no two studies measured either illicit drug exposure or psychosocial outcome in the same way. Additionally, potential confounding factors were inconsistently assessed across studies" (2004, p. 1582). Importantly, when studies have statistically controlled for potentially confounding factors, such adjustments have led to the attenuation (and sometimes the elimination) of associations between cannabis use and adverse use-related issues (e.g., Moore et al., 2007).

Research and the 'Real World'

Another important issue in the cannabis use literature is the lack of application of these findings on adverse use-related issues into meaningful discussions about the 'real world' consequences of the drug on ability to function in everyday life. Researchers typically ignore the possibility that the small but statistically significant differences found between cannabis users and non-users may have no real impact on users' daily functioning, and

therefore, may not represent problematic use. This proposition is supported in the conclusions drawn by Solowij et al. (2002) and Bolla et al. (2002) concerning the levels of cognitive impairment seen in cannabis users. These researchers deemed that the observed cognitive deficits were not clinically relevant, and were not likely to exert a negative effect on a user's ability to function in daily life.

The evident bias of some researchers in seemingly viewing all cannabis use as problematic might be explained by the clinical populations the researchers come in contact with. For example, Duncan et al. (2003) noted that individuals recruited for substance use studies were often convenience samples sourced through treatment services. These individuals typically accessed treatment through three pathways: either referral from a health professional or another third party; self-referral; or, in response to a court order. Thus, when data from these groups is compared to that from population- or school-based surveys, it becomes evident that the individuals accessing treatment services are more likely to be dependent, and experience more adverse use-related problems, than non-treatment seeking users (Duncan et al., 2003).

The differences evident between research based on treatment-seeking users and studies that assess users in the general population is indicative of the existence of a large hidden population of cannabis users who do not experience difficulties of a magnitude which would lead them to seek treatment for their cannabis use (Teesson et al., 2000). For example, 38% the of cannabis users assessed by Degenhardt et al. (2002) were classified as non-problematic users. Further, in Looby and Earleywine's (2007) study of daily cannabis users, only the 38% of the sample who met proxy criteria for dependence were found to experience significant use-related problems. Thus, although consuming cannabis daily, 62% of the sample was considered to be engaged in non-problematic use.

Summary

It is estimated that 10-15% of the population in Australia, the UK, and the USA are current cannabis users. Of these individuals, approximately 13-16% use daily, and a further 20-30% use cannabis on a weekly basis. There is a tendency for researchers to treat such weekly, or more frequent, cannabis use as 'problematic', with little consideration given to the hidden population of frequent cannabis users who do report use-related harms or problems in relation to their everyday functioning. This inclination to treat frequent users as a homogenous group has inhibited investigation of these individuals in relation to patterns of cannabis use and outcomes of use. Similarly, past research has typically concentrated on the association between frequency of cannabis use and adverse use-related issues, thus little is known about the roles potentially played by other facets of use.

Moreover, this body of research contains a number of inconsistent and often contradictory findings. Consequently, the nature of complex relationships between these variables has not been clearly delineated. As outlined above, there are numerous reasons for the inconsistencies in the literature. One is the lack of comparability of results due to methodological differences, including the utilisation of different cannabis use classification systems and research designs. Additional problems relate to the possible confounding of results because common risk factors and concomitant substance use are not measured or accounted for appropriately. Further, the reliance on simplistic cannabis use classification systems has resulted in inadequate understanding of the intricacies of cannabis use, and a failure to appreciate the diversity of cannabis users in society.

The cannabis user typologies developed by the Canadian Senate (2002) and UNODC (2006) are fairly detailed, however, they fail to incorporate a key aspect of use: motives. Although this aspect of use was alluded to through the variable, context of use, this does not provide enough information about the underlying reasons for use to be useful as a proxy

measure of motivation. For example, in the context of a party, some people may use to have fun, while others may use to relax, and still others, to fit in. It is important to note that variations in motives to use cannabis appear to be linked to dosage consumed, level of intoxication, subjective effects, and the adverse use-related issues experienced by users (e.g., Brodbeck et al., 2007; Green et al., 2003).

The limitations in the cannabis-related literature discussed in this Chapter have resulted in confusion as to how to best identify individuals at risk of experiencing use-related harms or problems, and indeed, as to whether cannabis use is dangerous, completely harmless, or somewhere in between. Clarification is required so that governments, opinion bodies, and individual users can make informed decisions about the use of cannabis. Additionally, better characterisation of users, and an understanding of the role cannabis use plays within the overall context of their lives, is required so that appropriately targeted prevention strategies and treatment interventions may be developed.

The Present Study

Overview and Objectives

It is apparent that the nature of cannabis use and cannabis users is not yet fully understood. This situation must be rectified if we are to make sense of the individual differences in outcomes and use-related issues that are evident in the general population, such as the impact on the everyday functioning of users. Therefore, a comprehensive investigation is proposed to explore the heterogeneity in the experience of cannabis use, the individuals who use it, and the potential impacts of various patterns of cannabis use on everyday functioning.

The four primary objectives for this investigation are outlined below. Specific hypotheses for each of these objectives will be detailed in the appropriate chapters (noted below) following more in depth discussion of relevant issues that are evident in the literature.

Objective 1: Cannabis Users

The first objective of this investigation is to describe the hidden population of cannabis users evident in the general population, with a particular focus on frequent users. Describing the nature of these cannabis users will include detailed examination of: demographic information (e.g., age, gender, and education); aspects of current lifestyle (e.g., marital, parental, and employment status); issues relating to childhood environment (e.g., family functioning, abuse) and individual factors (e.g., delinquency, ADD/ADHD); use of other licit and illicit substances (e.g., alcohol, ecstasy); and pre-existing mental and physical health issues (e.g., depression, sleep problems).

This investigation will inform us about the composition, lifestyle, and background of the hidden population of cannabis users evident in the general population. This is an under researched population. Typically, cannabis use studies follow one of two designs: non-users vs. users, or light users vs. heavy users. The former studies tend to involve the recruitment of university students, or are based on a subset of items from large general population household or school-based surveys. In contrast, the studies comparing different levels of cannabis use generally recruit treatment-seeking users. The target group for the present study tends to appear in the data collected through the general population surveys; so we know this hidden population exists, but know little about them beyond demographics.

With all estimates pointing to this hidden population of users being far larger than the heavily researched treatment population, it is clearly necessary for us to identify these users. Specifically, gaining a detailed picture of their current and childhood lifestyles is important as it will provide a context in which to understand their use of cannabis. Additionally, determining the level of heterogeneity in the demographic profile and current

lifestyles of this hidden population will help dismiss common assumptions about 'typical' cannabis users. The latter information will be valuable for government and health bodies, and could be utilised in the development of appropriately targeted public health and education campaigns. Further, the insight gained into the childhood/adolescent lifestyles of the participants will assist in the development of preventative and early intervention strategies.

Objective 2: Patterns of Cannabis Use

The second objective of this investigation is to increase knowledge about, and understanding of, the nature of cannabis use in the general population. This will entail a detailed examination of patterns of cannabis use, both past (e.g., age at first use, duration of use) and current usage, with a focus on the latter. The investigation into current patterns of use will cover: what is used (e.g., quantity and quality); how it is used (e.g., method of administration, cannabis/tobacco ratio); where it is used (e.g., physical and social context); when it is used (e.g., frequency, time of day); why it is used (e.g., motives, expectancies); and, what effects it has (e.g. subjective experiences, levels of intoxication). Additionally, risk factors will be investigated in relation to early initiation of use, heavy use, prolonged durations of use, and dependence.

Cannabis studies tend to focus on only one or two aspects of use, such as frequency of use, dependence, or early onset of use. This means that we do not have detailed knowledge about many facets of cannabis use (e.g., subjective experiences of use), and know less about overall patterns of use, particularly in relation to the under researched population of hidden users. It is probable that at least some of the research-neglected cannabis use factors are associated with adverse use-related issues. Additionally, it is important to determine the level of heterogeneity in patterns of cannabis use so that the classification of cannabis use factors in future research can be based on appropriate 'real world' levels, rather than being predominantly driven by the attributes of the sample at hand and the desire to

have similar sized research groups. For example, a realistic definition of 'problematic' use would be invaluable. Further, a detailed understanding of the nature of cannabis is essential if we are to be able to ascertain if we are even asking appropriate or important research questions within our studies.

The information gained about the nature of cannabis use in this non-clinical population of cannabis users will also be of value to health services. For example, information regarding potentially harmful aspects of cannabis use identified through the present study's detailed investigation could contribute to the development of relevant harm minimization strategies. This information may also be useful for identifying where public health dollars are best spent (e.g. raising awareness about the dangers of concurrent alcohol use vs. targeting the use of 'spin'). Further, a greater understanding of the role cannabis plays in the daily lives of users will assist in the development of services and materials designed for people trying to cut down or quit cannabis use.

Objective 3: Adverse Use-Related Issues

The third objective is to investigate: a) the nature of the association between cannabis use and previously reported adverse use-related issues; b) the likelihood of users experiencing these use-related issues; c) the severity with which they are experienced; and, d) the 'real word' impact of adverse use-related issues on the ability of users to function in daily life. The use-related issues of interest in the present study are current levels of psychopathology (specifically, depression, anxiety, and positive and negative psychotic symptomology) and cognitive functioning (specifically, cognitive failures, and everyday and prospective memory).

As noted previously, much of the literature regarding adverse use-related issues has been potentially confounded due to the lack of measurement or control of important variables. In the present study, investigations into adverse use-related issues will include potentially confounding factors, such as demographics, past life experiences and current lifestyle factors. Particular attention will also be paid to co-morbid drug and alcohol use, in

particular polydrug use, as well as pre-existing mental health problems. Further, comorbidity of psychopathology and cognitive impairment will also be addressed, with appropriate consideration given to diagnostic subgroups.

While the majority of studies investigating adverse use-related issues only focus on a small number of cannabis use factors (e.g., frequency of use, dependence, duration of use, early initiation), the investigations in the present study will be more extensive. Thus, factors such levels of intoxication, motives for use, and subjective experiences of use, will also be investigated. Further, in lieu of measuring THC/CBD dose (which is physically impossible in an Internet-based study), cannabis use will be quantified as thoroughly as possible. This will be done by supplementing the usual frequency of use data with information about the quantity and quality of cannabis consumed, including the cannabis to tobacco ratio of joints and cones consumed by the participants.

It is expected that the information resulting from these investigations will help to clarify the nature of the relationships between cannabis use and psychopathology and 'real world' cognitive function. As a cross-sectional study, it will not be possible make strong inferences about causality, however, it will be possible to identify the aspects of cannabis use that are most strongly associated with the adverse use-related issues assessed in the present study. Moreover, the determination of the likelihood of users experiencing these adverse use-related issues, the severity with which they are experienced, and the translation of this information into estimates of impairment in everyday functioning is particularly important. That is, while a large segment of the cannabis use literature reports differences between users and non-users, or between lighter and heavier users, it is extremely important that this information is then related back to real world functional differences so that the true impact of cannabis use can be ascertained. This information will be instrumental in determining problematic patterns of cannabis use, and thus will be invaluable in both clinical and community settings.

Objective 4: Cannabis User Typology

The fourth objective of this investigation is the development of a cannabis user typology; with the cannabis user types described in relation to their patterns of cannabis use, demographics, and current and childhood lifestyle factors. Importantly, the cannabis user types will be compared in relation to adverse use-related issues, such as everyday psychopathological and cognitive functioning. This typology will initially focus on the link between motives for cannabis use and the context of such use. It is posited here that it is the combination of motives and context (both physical and social) that will best determine patterns of cannabis use. That is, motive will lead an individual to seek an appropriate context for use, and then both of these factors will contribute to other aspects of use, such as dose consumed, methods of administration, and subjective experience of use. For instance, an individual who seeks relief from an emotionally distressing situation may decide to use at home, in isolation from others, and to consume enough high potency cannabis to 'escape from reality'. However, sometimes the context will lead to a motivation to use cannabis, with both factors contributing to other aspects of use. For example, if an individual at a party is passed a joint by a friend, they may decide it would be fun to partake, and take a puff or two before passing the joint on to the next person.

There are two key differences between the proposed approach to investigating cannabis use and more traditional investigations. While traditional research designs are primarily focused on assessing the effects of individual variables in relative isolation, a typology is focused on the participants' patterns of responses over a large number of variables. Further, traditional studies typically treat cannabis users as a relatively homogenous group, while ignoring the heterogeneity of cannabis users and patterns of cannabis use evident in society. This tends to lead to research designs based on a 'one-size-fits-all' mentality, with researchers seeking a single solution or answer that suits all (or at least most) users, rather than acknowledging that there are likely to be multiple answers; with different

subgroups of users having different experiences and outcomes of use. Thus, a cannabis user typology (of the kind proposed in the present study) will provide the basis for a holistic understanding of cannabis users and their patterns of use. Moreover, it is hypothesised that the cannabis user types identified in the present study will differ in relation to adverse use-related issues, and experience differing levels of everyday functioning.

Expected Outcomes

It is suggested that the findings of this investigation will provide greater insight into the nature of both cannabis use and cannabis users in the general population, and increase understanding of the adverse use-related issues experienced by these users. It is anticipated that the identification and examination of cannabis user types will assist in our understanding of why some individuals experience adverse use-related issues and not others; thus, enabling the differentiation of 'problematic' and 'non-problematic' patterns of cannabis use. Accordingly, information gained through this study will facilitate the tailoring of psychological treatment for cannabis users, and the development of appropriately targeted primary prevention and harm minimization programs for the education of current and potential users. These research findings will also be relevant to the ongoing debate regarding cannabis policy (e.g., legal status, medicinal use) in countries such as Australia, the UK, and the USA.

Thesis Structure

Chapter 2 covers the methodological aspects of the present study, including the study questionnaire and website, and the recruitment of study participants. Information relating to Objective 1 is contained Chapters 3 and 4, which encompass a detailed exploration of participants' current and childhood lifestyles (respectively). Objective 2 is addressed in Chapters 5-8. Specifically, Chapter 5 contains an investigation of the initiation of cannabis

use, Chapter 6 describes the participants' current patterns of use, and Chapter 7 explores heavy, prolonged, and dependent cannabis use, while Chapter 8 encompasses a detailed exploration of motives for use and subjective experiences of use.

Objective 3 is addressed in Chapters 9 and 10, which contain the examination of adverse use-related issues; everyday psychopathological and cognitive functioning, respectively. Chapters 11-13 relate to Objective 4, with Chapter 11 detailing the development of the cannabis user typology, Chapter 12 containing the exploration of the cannabis user types, and Chapter 13 investigating the everyday functioning of the user types. The findings are discussed together in Chapter 14, where limitations of the present study are canvassed, and future directions are indicated.

CHAPTER 2
RESEARCH TOOLS & PARTICIPANT RECRUITMENT

Introduction

The first section of this Chapter provides an overview of The Cannabis Experience and Everyday Functioning questionnaire, while the second section describes the website. The process of development for both these tools is discussed at length in Appendix A. To summarise, the initial developmental phase involved extensive review of the relevant literature in an effort to identify factors that were reportedly associated with cannabis use: as precursors, correlates, or consequences of use. Existing measures were also reviewed in this phase in an effort to identify the best manner in which to collect data for each of the various variables to be assessed in the questionnaire. The second phase involved pre-testing the initial version of the questionnaire, and making alterations based on the resultant data and feedback. The third phase of development, pilot testing, comprised the change from a paper-and-pencil format to a fully operational Internet-based survey. The final version of the questionnaire and website were determined after consulting the pilot test data and feedback from participants. The final web pages are provided on the attached computer disc, with the associated Internet survey script for the website, and the codebook for the questionnaire.

The decision to employ an Internet-based survey for the present study was based on a number of factors. A primary consideration, with the researcher based in an Australian rural setting, was access to potential participants. The Internet is an appropriate medium for accessing potential participants in the target population (i.e., English-speaking, younger age groups – the peak age for cannabis use is 20-29 years). Additionally, the benefits afforded by the Internet in terms of anonymity were important as the study involved collecting information on an illegal activity (illicit drug use) and other sensitive information (e.g., history of sexual abuse). A further advantage was the efficiency enabled through employing an

Internet-based survey, particularly in relation to questionnaire design issues, time, and money. It was also important to be aware of and address potential drawbacks of using an Internet-based questionnaire, such as the need to screen the data carefully for contrived or fallacious data. The data screening procedures implemented in the present study are discussed in this Chapter in association with the outcomes of the recruitment campaign. The other issues related to Internet-based research raised here are discussed in greater depth in Appendix B.

The participant recruitment methods for the present study reflected the online nature of the questionnaire; with the primary calls for participation issued through emails and online forums. This had an impact upon the development of the recruitment materials, such that they were specifically designed to suit the mode of communication and the target audience. The recruitment process is described in detail in the third section of this chapter, the outcome of the recruitment campaign is discussed in the fourth section, while the associated recruitment materials are included in Appendix C.

The Questionnaire

Overview

The focus of this section is on the aspects of the final questionnaire content that are specifically relevant to the objectives under investigation in the present study. A number of items that were included in the questionnaire were deemed to not be necessary for the present study. That is, these items were developed with the aim of being as thorough as possible, but the vast amount of data provided by study participants was beyond the scope of the project's stated objectives. Further discussion of these items is provided in Appendix A.

Additionally, to avoid repetition (where possible), only brief descriptions of questionnaire items and variables are provided in this Chapter, with detailed information

provided in Chapters 3-10. This arrangement allows the items and variables to be discussed directly in association with relevant data analyses.

Content

The questionnaire focused on cannabis use and cannabis use-related issues. As such, it was designed to include detailed questioning of cannabis use, and to collect data on other licit and illicit substance use, psychological wellbeing and distress, cognitive functioning, as well as various aspects of current and past lifestyles, including demographic and background information.

Substance Use

Substance use was assessed in terms of both current and past use. Cannabis use was explored extensively, and due to their high levels of use in the general population, alcohol, tobacco and ecstasy (MDMA: methylenedioxymethamphetamine) were covered in more detail than other licit and illicit substances. For example, 50% of Australians adults drink alcohol at least weekly, 17% smoke tobacco daily, and ecstasy is the third most commonly used illicit substance, after cannabis and non-medical use of analgesics (AIHW, 2005). The substance use items and variables that are relevant to the objectives under investigation in the present study are described briefly below.

Cannabis use. The items relating to cannabis were devised to provide detailed information about progression of use, from initial opportunity through to regular use patterns. Also included were detailed questions regarding frequency, quantity, and potency of the cannabis consumed. Questions about cannabis use included: motivations for using, experience while intoxicated, patterns of use, administration method, and detailed questioning about the first time the individual used cannabis. These items are described in Chapters 5-8, where relevant, and include: early onset of use (< 16 years), peak level of use, duration of use, proxy cannabis dependence, current frequency of use, number of

cones/joints consumed per week, strength of cones/joints consumed, approximate daily cannabis dose, normal level of intoxication, subjective experience of intoxication, and motives for using cannabis.

Items relating to motivations for cannabis use and the context of such use (both physical and interpersonal) were utilised in the development of a cannabis user typology. Thus, they are described in detail in Chapter 11.

Other substance use. Items relating to the use of alcohol, tobacco and ecstasy covered information about progression of use, and the frequency, quantity, and potency of the substances consumed. Of this information, items relating to current frequency of consumption, and age at initiation of use, were employed in the present study. Other substances covered briefly in the questionnaire included: amphetamines, methylamphetamines, cocaine, heroin, acid (e.g.., trips, LSD: lysergic acid diethylamide), inhalants, crack, GHB (gamma-hydroxybutyric acid), ketamine, PCP (phenylcyclohexylpiperidine), solvents, herbal stimulants, magic mushrooms, kava, and other natural hallucinogens. The use of the following prescription medicines for non-medical purposes was included: painkillers, tranquillisers, barbiturates, methadone, and steroids. There was also space provided for participants to list any other substances they had used. This information was used to look at past and current polydrug use.

Psychopathology

Psychological wellbeing and distress. The 18-item version of the Mental Health Inventory (Ware, Manning, Duan, Wells, & Newhouse, 1984), a self-report measure of mental health designed for use in the general population, was employed to assess psychological welling and distress. This measure is described in more detail in Chapter 9.

Psychotic symptomology. The 22-item brief version of the Schizotypal Personality Questionnaire (SPQ-B) (Raine & Benishay, 1995) was utilised to assess psychotic symptomology. Detailed information about this measure is included in Chapter 9.

Cognitive Functioning

Cognitive failures. The 25-item Cognitive Failures Questionnaire (Broadbent, Cooper, FitzGerald, & Parkes, 1982) is a self-report measure of perceived frequency of cognitive slips in perception, memory and motor function. This measure was employed to assess everyday cognitive functioning, and is described in detail in Chapter 10.

Everyday and prospective memory. The 15-item Everyday and Prospective Memory scale (EPM) consisted of items selected from the Everyday Memory Questionnaire (EMQ) (Sunderland, 1983) and the Prospective Memory Questionnaire (PMQ) (Hannon, Adams, Harrington, Fries-Dias, & Gipson, 1995), and some specifically developed items. The development of this measure is described in detail in Appendix A, and its attributes are covered in Chapter 10.

Demographic and Lifestyle Items

Demographic items and those relating to lifestyle (current and past) were included if they had been previously assessed in the literature and found to be related to cannabis use in some way (e.g., as a risk factor, confound, correlate, or outcome of use).

Demographic items. Demographic information collected included: age, gender, education level, nationality, marital status, and employment. These items are described in detail in Chapter 3.

Current lifestyle. Individual factors that may be related to current lifestyle included: current mental health issues (e.g., psychosis, bipolar disorder), physical health issues (e.g., chronic fatigue, cancer), and experience of traumatic events. These items are specified in Chapter 3 together with items relating to current environmental factors, such as living arrangements, family structure, and geographic location.

Childhood lifestyle. Questions tapping childhood lifestyle covered individual factors such as: behavioural issues (e.g., truancy, gang membership, petty crime), mental health issues

(e.g., depression, anxiety), and physical health issues (e.g., brain injury, chronic illnesses). These items are described in greater detail in Chapter 4, in conjunction with the two factors that were developed from these items: delinquent behaviour, and childhood psychopathology. Similarly, items relating to childhood environmental factors were used to generate two new variables: family dynamics and family addiction problems. These two variables and other childhood environmental items, such as family structure, parental occupation, and abuse, are also described in detail in Chapter 4.

Sensation seeking. Another individual factor explored in the present study is sensation seeking, which was assessed with the Brief Sensation Seeking Scale (BSSS-4) (Stephenson, Hoyle, Palmgreen, & Slater, 2003) and the Sensation Seeking Index (SS2) (Slater, 2003). Both measures are described in more detail in Chapter 3.

The Website

Site Description

The questionnaire was located on an open site, meaning that it could be accessed by anyone. IP addresses (the unique Internet address of a computer) were logged for all people visiting the site to allow for data screening. Time and date stamping was also employed.

Navigation

A progress bar at the bottom of each page indicated how far the participant had progressed through the questionnaire and how much of it still remained to be completed. However, the actual number of questions answered by each participant was dependent on their responses to stem questions. If a participant's answer to a stem question necessitated answering further questions from that stem, they continued down the page to the next question. However, if a participant's answer to the stem question did not necessitate

answering any further related questions, their browser was automatically directed to the next relevant page.

A 'continue' button was at the bottom of each page. Participants reaching the bottom of the page, without being skipped to another page, clicked on this button to get to the next relevant page. Clicking on these buttons also resulted in the submission of data entered on that page.

Response Formats and Options

A variety of response formats were used throughout the questionnaire. These included selecting options from drop-down menus, clicking on radio buttons or check-boxes, and typing in responses. Many items contained 'not applicable' and 'other' response options to ensure that participants could adequately answer all questions they encountered. All 'other' response options were followed by a text box where participants were asked to specify the nature of this 'other' response.

Due to the nature of the research topic it was necessary to ask questions of a sensitive nature, such as items covering suicidal behaviour, and history of domestic violence and sexual abuse. Questions of a sensitive nature, therefore, had an 'I prefer not to answer this question' response option.

Site Contents and Structure

The website consisted of eight sections, 92 pages, and 727 items. The final Internet survey script for the website, codebook for the questionnaire, and web pages, are provided on the attached computer disc.

Front page

The front page of the web site consisted of an informed consent form. It contained details about the questionnaire, including: information about the content of the questionnaire

and the purpose of the study; a statement informing potential participants that they could withdraw from the study at any time; assurances about confidentiality and anonymity; the approximate time taken to complete the questionnaire; ethics approval information; and, contact details for the researchers involved in the study. Also included on the front page were contact details for counseling, mental health, and substances use services, which could be accessed by those who wanted support with regard to any of the issues raised in the questionnaire.

To continue to the questionnaire, participants were asked to click on a button labeled 'Start Survey'. This button was located directly below the following text: 'By clicking below you are agreeing that you understand the nature of this study and wish to take part, thus giving your consent to participate.'

The Questionnaire

The main body of the web site comprised the questionnaire. It was organised into eight sections, with the following content:

The first section of the questionnaire, Questions about Your Current Lifestyle, contained the measures assessing psychopathology (i.e., psychological wellbeing/distress and psychotic symptomology) and cognitive functioning (i.e., cognitive failures, and everyday and prospective memory). All of the items in Section 1 were viewed by all participants, while in other sections there were stem questions and branching (as described previously).

Sections 2- 6 related to substance use. The first of these, Questions about Alcohol, consisted of items relating to initiation and progression of use, alcohol-related experiences, dependency, reasons for ceasing alcohol use, patterns of use, peer use, and future use. While, Section 3, Questions about Tobacco, contained items covering initiation of use, tobacco-related experiences, dependency, reasons for ceasing tobacco use, patterns of use, peer use, and future use. The largest part of the questionnaire was Section 4, Questions about Cannabis. It encompassed initiation and progression of use, cannabis-related experiences,

dependency, reasons for ceasing cannabis use, patterns of use, context of use, subjective experiences of intoxication, peer use, and future use. The fifth section of the questionnaire, Questions about Ecstasy, contained items covering initiation of use, ecstasy-related experiences, reasons for ceasing ecstasy use, patterns of use, peer use, and future use. Section 6, Questions about Other Drugs, included items covering use of over-the-counter or prescription medication for non-medical purposes, and illicit drugssuch as: amphetamines, methylamphetamines, cocaine, heroin, acid, inhalants, and other illicit or natural substances used for psychotropic effects. Participants were also asked about injecting behaviour, and their substances of choice.

Sections 7 and 8 covered current and past lifestyle and demographic information. Questions about your Childhood Lifestyle, was the seventh section of the questionnaire. It encompassed questions relating to family structure, dynamics and dysfunction, and individual behavioural factors. Section 8, Questions about You, covered basic demographic information, employment/occupation, education level, living situation, physical health issues, and psychological issues including: depression, anxiety, panic attacks, psychosis/schizophrenia, sleep problems, alcohol dependency, drug dependency, and brain injury. In this section, participants were also assessed for sensation seeking, sensitive topics and traumatic incidents (e.g., history of physical and/or sexual abuse/assault).

End Pages

The last three questions included an item about current intoxication, a text box for comments about the study; and an item asking participants how they found out about the study. These items were placed on a final debriefing page. On this page, participants were also thanked for taking part, and provided with more detailed information about the purpose behind the study. Additional information presented covered current knowledge about the outcomes of cannabis use, a warning about the dangers of mixing drugs, and information relating to some harmful drug combinations.

Contact details for counseling, mental health, and substances use services were listed, similarly to those on the front page. However, these contact details were prefaced by an advisement that if participants reported experiencing psychological distress or possible symptoms of psychosis in Section 1, they should seek professional help. Contact details for the researchers involved in the study were also provided on this page. Clicking on the 'I'm Done' button at the end of this page took participants to the final page of the questionnaire, which contained a message thanking participants for taking part in the study.

Recruiting the Participants

Overview

Participants were recruited through a number of methods, including online message board and forum postings, emails, Internet advertising, and a first year psychology research participation course component at the University of New England (UNE), Australia. Calls for participation were also distributed through email mailing lists and posted on Internet sites. Recruitment materials and methods were specifically developed to be compatible with the planned modes of communication and to be acceptable to the target audience. Thus, the recruitment materials were designed primarily for two campaigns: email 'snowballing', and online message board and forum postings. These materials and information regarding their evolution during the study are included in Appendix C.

There were no specific cannabis use-related inclusion criteria as anyone (over 18 yrs of age) was welcome to participate in the study, regardless of their level of cannabis use. Further, the recruitment campaign sought to also gain the participation of non-users of cannabis to enable the formation of a control group.

The Recruitment Process

Recruitment Emails

Snowballing. 'Snowballing' is a technique that usually entails the recruitment of participants through a chain-referral method, where participants introduce the researcher to other potential participants, who, in turn, introduce the researcher to further potential participants (Swift, Hall, Didcott, & Reilly, 1998). For this study, 'snowballing' was achieved through the use of emails. This entailed emailing a recruitment message to a group of potential participants and requesting that they forward the email on to other people.

The initial recruitment email, "George W Bush inhaled..." (see Figure C1), was sent to 45 people on the 18th of July, 2005. All recipients were known to the researcher. A brief email was sent to the same group of people on the 1st of August, 2005, reminding them about the study, and encouraging them to participate and forward the email on to people they knew. The second recruitment email, containing the poem (see Figure C2), was sent on the 27th of August, 2005, and a final 'thank you' email was sent on the 26th of September, 2005.

Thank you emails were also sent to study participants who had requested a summary of the results. The first batch of these emails was sent on the 21st of August, 2005, to 39 participants, and the second, on the 26th September, 2005, was sent to 35 participants. Email correspondence ensued with a number of participants who requested further information about the study, wanted to provide detailed feedback about the survey, or wanted to inform the researcher about themselves or their situation. The text for all of the email recruitment messages are provided in Appendix C.

Online Message Board and Forum Postings

Calls for participants that were posted on message boards or forums were variations on three different messages. The first type of message was a straight call for participation,

with long and short versions. The long version was typically posted on cannabis related Internet sites, while the short version was posted on non-cannabis sites (see Appendix C for the content of these messages).

Calls for participation were posted primarily on cannabis-related sites (see Table 2.1), but messages were also posted on other sites (see Table 2.2). Before being able to post on an online forum, registration was generally required. This process was occasionally instantaneous, after providing a username and password, but typically involved replying to an automatically sent email to validate the registration request. A few boards had a lengthier process, in which case one of the board's moderators manually approved the registration.

When posting a message on most forums, there was an option to have a notification email sent when anyone replied to the message. In other cases, it was necessary to check the forum regularly to monitor responses. The majority of the recruitment postings gave rise to a number of responses. All replies to messages were responded to quickly by the researcher. Primarily, this process involved rapport building with the online community, and included responding to queries, comments, and the occasional complaint or challenge, and providing an online presence or identity with which community members could relate. A second reason prompt replies were beneficial was due to the dynamics of online forums; replying to a message moves its thread back to the top of the message listings. This is important, particularly on heavily trafficked forums, because once a message thread has moved to the second, or subsequent, page of messages it is less likely to be read by forum members.

The significance of these dynamics became apparent very early in the recruitment process, as did the need to encourage replies from forum members, rather than just having people read the message. That is, if a number of people were replying on the recruitment thread, even if their responses were off-topic (as happened fairly frequently), the number of people viewing the call for participation was increased. The poem posting was found to produce more replies than the straight messages, therefore it was employed most of the time.

The number and type of postings on each forum was dependent on the amount of traffic the forum received, and the general response to the messages posted. Forums with little traffic did not always require the creation of a new thread when posting a thank you message, as the initial message was still on the front page. In these instances, the thank you message was added to the end of the previous thread. On some forums, with very favourable responses to the calls for participation, additional messages were posted. On other forums of the latter type, the thread was often kept alive for long periods of time, due to many responses, so posting additional messages was not necessary. The number of times each message was viewed and the number of replies posted are listed in Tables 2.1 and 2.2.

Most forums were welcoming and interested, with the people who attempted or completed the questionnaire requesting more information about the research, or providing comments about the study. Some forums, however, were quite hostile initially, with concerns raised about submitting information about illegal behaviours to an unknown person or organisation. Hostility was related to individual beliefs that the research might be biased against cannabis use, and was only designed to find negative outcomes with regards to use. After presenting the aims of the study and defending the unbiased nature of the research, most people were happy to be involved and extremely interested in what the research might find. Participant feedback relating to how the questionnaire could be improved was also sought on some forums. This was often in response to a criticism of questionnaire items, whether the issue related to the wording, the types of questions included, or the lack of certain response options.

Web Site and Internet Mailing List Submissions

Information about the study was submitted to a number of sites with either a request for a listing on the site, or for the information to be sent out to the site's mailing list.

Sites with online research listings. On the 18th of July, 2005, the study was submitted to four Internet sites with listings of online research surveys and experiments. These sites were:

Table 2.1

Recruitment Messages Posted on Cannabis-Related Online Message Boards and Forums

Site name	Internet address (www)	Forum name	Message type	Date posted*	Views	Replies
Marihemp: the marijuana and hemp network	marihemp.com	Research	Long	19th July	- [a]	0[b] (0)[c]
Marihemp: the marijuana and hemp network	marihemp.com	General Talk	Long	19th July	-	5 (2)
			Thanks	14th August	-	2 (1)
Oz Stoners	ozstoners.com	Stoner Café - Session Rooms - Club House	Long	19th July	59	3 (1)
			Thanks	14th August	58	4 (1)
Bubble Bags	bubblebag.com	General Discussion	Long	19th July	55	3 (1)
			Thanks	14th August	37	0 (0)
Marijuana.com: Marijuana and Cannabis Information	420.marijuana.com	420 Lounge - General 420 Talk	Long	19th July	323	13 (5)
		Message moved by Moderator		20th July		
		Entertainment - Cool Links	Thanks	14th August	37	0 (0)
Cannabis.com: Quality Marijuana and Hemp Information	cannabis.com	Lounge	Long	19th July	63	2 (1)
			Thanks	14th August	39	0 (0)
Cannabis Culture Marijuana Magazine	cannabisculture.com	The Cannabis Café - Socializing Lounge	Poem	20th July	35	2 (1)
			Thanks	14th August	142	11 (4)
UK Cannabis Internet Activists	ukcia.org	Cannabis in General	Poem	20th July	-	0 (0)
			Thanks	4th September	-	11 (4)
Toke Up Online Cannabis Community	tokeup.com	General Chat - The Toke-up Café	Poem	20th July	73	8 (1)
			Thanks	14th August	63	4 (2)
420 TIMES.COM: The Online Hemp and Marijuana Magazine	420times.com	420 Lounge - General Talk	Long	20th July	-	-
		Message deleted by Moderator		20th July		
		420 Lounge - High Stories and Creative Expression	Poem	20th July	158	25 (9)
			Thanks	16th August	146	16 (6)
Weedcity	marijuana-cannabis.co.uk	Roll a Phatty	Poem	21st July	26	1 (0)
			Thanks	14th August	32	2 (1)

Table 2.1 (Continued)

Site name	Internet address (www)	Forum name	Message type	Date posted*	Views	Replies
Everyone Does It	everyonedoesit.co.uk	General Forums - General Chat	Poem	21st July	152	18 (2)
			UK in 4th	5th August	199	40 (12)
			Thanks	14th August	124	11 (5)
			Hey, I hit 1000	26th Sept	187	28 (6)
Overgrow Cannabis Cultivation Network	overgrow.com	Smoker's Lounge - High Entertainment	Poem	24th July	14	1 (0)
			Thanks	14th August	19	0 (0)
Overgrow Cannabis Cultivation Network	overgrow.com	Mota20's Medical Club	Short	24th July	90	4 (2)
			Thanks	14th August	39	0 (0)
Devil's Harvest: Growing Marijuana, Smoking Weed, Legalize Life...	devilsharvest.com	General - Anything You Want	Poem	21st August	-	-
		Message deleted by Moderator		22nd August		
			Thanks	4th September	23	0 (0)
Cannabis World Online	cannabisworld.org	General Discussion - Burn Juan Café	Poem	21st August	273	13 (3)
			Thanks	4th September	21	0 (0)
NORML New Zealand	Norml.org.nz	Get Active	Modified Long	21st August	37	0 (0)
			Thanks	11th Sept	30	0 (0)
MedPot.net	medpot.net	Medicinal Marijuana	Modified Long	21st August	40	5 (2)
			Thanks	11th Sept	26	2 (1)
WeedTRACKER: California Cannabis Co-op News and Reviews	weedtracker.com	Medicinal Marijuana News	Modified Long	21st August	15	0 (0)
		Talk of the Town - What's Going on?	Thanks	11th Sept	16	0 (0)
Planet Skunk: Cannabis and Marijuana Growing	planetskunk.com	Coffee Lounge	Poem	22nd August	298	25 (8)
			Thanks	4th September	24	0 (0)
UK420	uk420.com	Cannabis Culture - UK420 Free For All	Poem	22nd August	406	23 (8)
			Thanks	4th September	54	0 (0)
Pot Revolution Australia	p221.ezboard.com/ bpotrevolutionaustralia	The Mull Bowl	Poem	22nd August	-	-
		Message moved by Moderator		13th Sept		
		High There			-	4 (2)
Compassionate Coalition	compassionatecoalition. org	General Discussion	Modified Long	22nd August	49	0 (0)
			Thanks	4th September	24	0 (0)

Table 2.1 (Continued)

Site name	Internet address (www)	Forum name	Message type	Date posted	Views	Replies
Medical Marihuana: Canada's Official Medical Marihuana Resource Website	medicalmerihuana.ca	Discussion Forum	Modified Long	22nd August	-	2 (1)
			Thanks	11th Sept	-	0 (0)
Republic of Cannabania	republicofcanna.10.forumer.com	General Chat	Poem	27th August	152	18 (8)
Skunk Magazine	skunkmagazine.com	Lounge	Poem	27th August	183	3 (1)
			Thanks	11th Sept	91	8 (4)
Weed Farmer	weedfarmer.com	Funny Weed Files	Poem	27th August	40	4 (2)
			Thanks	11th Sept	29	0 (0)
Hemp City	hempcity.net	Let's Talk Hempcity	Poem	27th August	24	0 (0)
			Thanks	11th Sept	41	0 (0)
TOTAL					4,066	321 (107)

* All messages posted in 2005

[a] Information not listed on site or deleted before it could be recorded by the researcher

[b] Total number of replies

[c] Number of replies made by the researcher

Table 2.2

Recruitment Messages Posted on Non-Cannabis Online Message Boards and Forums

Site name	Internet address (www)	Forum name	Message type	Date posted*	Views	Replies
Weirdears: for indie and alternative music	weirdears.com	Chat - Random Chat	Short	20th July	-[a]	-
			Thanks	14th August	-	-
Singularity	singularity.net.au	Flurp.net - Health and Environmental Issues	Long	22nd July	45	5[b] (3)[c]
inthemix.com: inside dance music	inthemix.com.au	General Interest - General	Short	22nd July	-	-
		Message deleted by Moderator		22nd July		
		Reposted		5th August		
			Thanks	14th August	97	5 (2)
I Love Philosophy	ilovephilosophy.com	Mundane Babble	Short	22nd July	111	6 (2)
			Thanks	14th August	58	2 (1)
Triple J	abc.net.au	Off topic - General Chat	Short	22nd July	-	0 (0)
			Thanks	14th August	1	4 (1)
Blindreaper	blindreaper.com	Help	Long	22nd July	46	4 (0)
The Chaser	Chaser.com.au	Everything else	Short	24th July	28	0 (0)
			Thanks	14th August	345	46 (17)
PerthMUNCH.com	perthmunch.com	General Central	Poem	21st August		
		Message moved by Moderator		21st August		
		Happy Things			76	12 (5)
		Topic closed by Moderator		22nd August		
Best British Board	p082.ezboard.com/ bdownthepub	Down the Pub - Main Bar	Poem	25th August	139	59 (10)
			Thanks	4th September	47	5 (2)
Alternative Press	altpress.com	A.P. Mosh Pit - Whatever	Poem	27th August	220	20 (7)
			Thanks	11th September	70	5 (0)
Uncommon Knowledge	uncommonforum.com	Community Support - Light Lounge	Poem	27th August	24	0 (0)
			Thanks	11th September	33	2 (0)

Table 2.2 (Continued)

Site name	Internet address (www)	Forum name	Message type	Date posted	Views	Replies
Wasted Space	p072.ezboard.com/ fundiesdownunderpub	Speak Up	Poem	27th August	81	22 (6)
			Thanks	11th September	35	5 (2)
Fred's World	fredwheeler.proboards57.com	General Board	Poem	27th August	15	0 (0)
			Thanks	11th September	7	0 (0)
Fantasy Games Central	p092.ezboard.com/ ffantasygamescentral	The Hot Boxes - The Chatter Box	Poem	27th August	-	16 (4)
			Thanks	11th September	-	-
Uncommon Knowledge	uncommonforum.com	Mental Health - Addictions	Modified Long	4th September	69	0 (0)
London Gumtree	gumtree.com	Community - Community	Poem	11th September	-	-
			George W	16th September	-	-
Sydney Gumtree	gumtree.com.au	Community - Community	Poem	11th September	-	-
			Reposted	1st October	-	-
Brisbane Gumtree	brisbane.gumtree.com.au	Community - Community/Sports	Poem	11th September	-	-
Auckland Gumtree	gumtree.co.nz	Community - Community	Poem	11th September	-	-
Johannesburg Gumtree	johannesburg.gumtree.co.za	Community - Community	Poem	11th September	-	-
Dublin Gumtree	gumtree.ie	Community - Community	Poem	11th September	-	-
Cardiff Gumtree	Cardiff.gumtree.com	Community - Community/Sports	Poem	11th September	-	-
Cambridge Gumtree	cambridge.gumtree.com	Community - Community/Sports	Poem	11th September	-	-
Applecatcher Classifieds	Applecatcher.com	Community - Community	Poem	11th September	11	-
TOTAL					1,558	218 (62)

* All messages posted in 2005

[a] Information not listed on site or deleted before it could be recorded by the researcher

[b] Total number of replies

[c] Number of replies made by the researcher

- Lab United International Online Research: www.w-lab.de/lab-united/actual.php (listed on 20/07/05)
- The Web Experiment List: www.genpsylab-wexlist.unizh.ch (listed on 20/07/05)
- Online Social Psychology Studies: www.socialpsychology.org/expts.htm (listed on the 23/07/05)
- Psychological Research on the Net: www.psych.hanover.edu/Research/ exponnet.html (listed on 25/07/05)

Search engines. The site was listed with the following search engines, on the 18th of July, 2005:

- Yahoo – social science/psychology/research/tests and experiments
- DMOZ open directory project (covering Google, AOL search, AltaVista, HotBot, Lycos, Netscape search, DirectHit) – science/social science/psychology/ tests and testing/online experiments

Cannabis-related sites. During the recruitment phase, information about the study was submitted to various cannabis-related sites. It was listed on the following sites:

- 420TIMES.COM: The Online Hemp and Marijuana Magazine: www.420times.com/links/ (listed 21/07/05)
- Multidisciplinary Association for Psychedelic Studies: www.maps.org/ volunteer.html (listed 24/07/05)
- Nimbin HEMP Embassy: www.hempembassy.net/hempe/ (listed 29/07/05)

Internet mailing lists. Information about the study was sent out to the following Internet mailing lists:

- Cannabinoid Science: www.health.groups.yahoo.com/group/cbscience (sent 24/7/05)

- Multidisciplinary Association for Psychedelic Studies: www.maps.org/foruminfo/html (initial call for participants sent 24/7/05, thank you message sent 26/7/05)

First year psychology research participation

The study was also listed as an option for the research participation component of the first year psychology course at UNE. This entailed providing a brief description of the study and access details for the questionnaire. Students were able to choose from a number of research studies. Students choosing to participate in this study clicked on the link provided, and then contacted the researcher by email after completing the questionnaire. An information sheet with more details about the study was then emailed to the student. The study was listed as an option for the research participation component of the first year psychology course at UNE, on the 26th of July, 2005.

Google AdWords

The study was advertised on the Internet through Google AdWords. This advertising campaign consisted of a short message that was displayed in the sidebar of the Google search Internet site, on other sites that display Google advertisements, and through other Google products, such as the Gmail email service (see Appendix C for the content of this message). The campaign covered Australia, the USA, the UK, New Zealand, and Ireland. These countries were chosen because they represented the majority of individuals who had accessed the website prior to the initiation of the Google AdWords campaign.

On the 16th of September, 2005, the Internet advertising campaign was initiated through Google AdWords. The campaign ended on the 3rd of October, 2005.

Recruitment Campaign Outcomes

Website Statistics

Website Access

During the data collection period, 19th July to 3rd October, 2005, there were a total of 7,747 visits to the website. Of these visits, 6,229 (80%) were unique visitors, people who were accessing the site for the first time. On average, there were 1.24 visits per visitor, indicating that approximately 1,500 people accessed the site more than once during the data collection period. The number of visits per month is illustrated in Figure 2.1. It is evident that the number of visits increased dramatically in September, 2005, in response to the Google AdWords campaign.

The website was accessed by visitors using Internet service providers from 48 different countries, with the majority accessing from the USA (61.4%), followed by Australia (14.1%), the UK (7.3%), and Canada (6.7%).

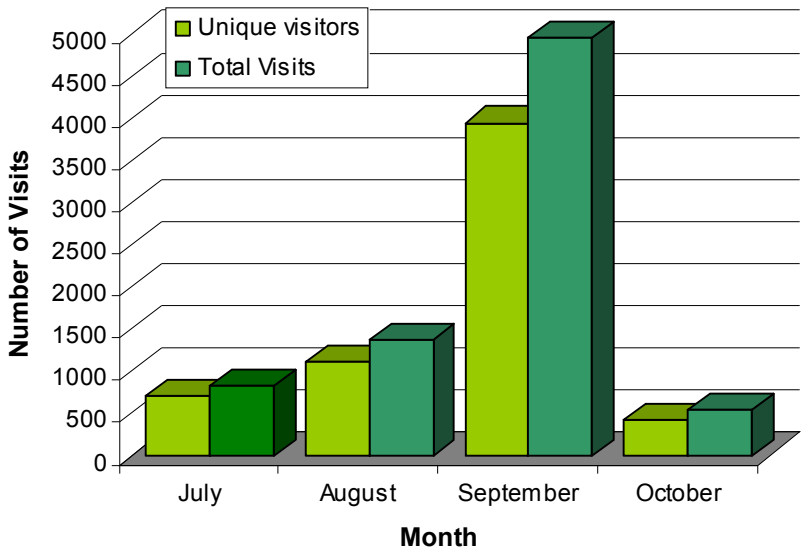

Figure 2.1. Number of unique visitors and total visits to the questionnaire website, by month

Recruitment Methods

The majority (55.5%) of people accessing the website during the data collection period were recruited through the Google AdWords campaign (see Figure 2.2). The next most successful recruitment strategy was the email campaign (19.3%). However, it was not possible to distinguish between those participants attracted to the Internet site by the recruitment emails and those who responded to calls for participation sent to the Cannabinoid Science and Multidisciplinary Association for Psychedelic Studies mailing lists. Listings on websites, such as online research listings, and postings to online forums and message boards both accounted for approximately 10% of total visitors accessing the website. A total of 45 people (0.6%) accessed the study through the first year research participation program at UNE.

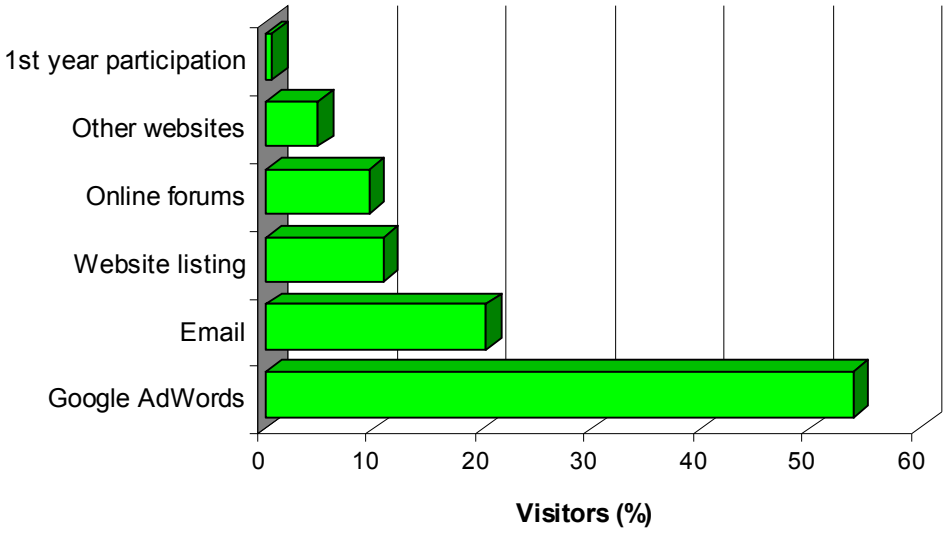

Figure 2.2. Recruitment method through which visitors were attracted to the website

As depicted in Figure 2.2, 4.8% of visitors (374 people) accessed the study through other websites; sites on which recruitment messages were not placed by the researcher. This

suggests that some participants may have posted messages about the study on other websites. A total of 33 sites fell into this category.

These sites included:

- keene.blackboard.com/bin/common/course.pl (78 people)
- www.online-studies.org (75 people)
- blackboard.odu.edu/bin/common/course.pl (73 people)
- emu.heidelburg.edu/moodle/mod/resource/view.php (51 people)
- www.playnow.com.au/cgi-bin/ultimatebb.cgi (31 people)
- www.wickeddownloads.com/wdboard/index.php (25 people)
- blackboard.its.txstate.edu/bin/common/course.pl (19 people)
- www.lamainverte.org/forum/viewtopic.php (13 people)

Online message board and forum postings. Five hundred and sixty-four individuals (7.3%) accessed the website in response to postings on cannabis-related online message boards, while 191 (2.5%) accessed the site in response to postings on non-cannabis-related message boards and forums. Although recruitment messages were often viewed by large numbers of people, it is apparent that this did not translate to large numbers of people accessing the website. The ratio of views to site accesses was approximately 7:1 for the cannabis-related sites, and 8:1 for other types of sites, suggesting only occasional uptake of the study invitation.

Website and Internet mailing list submissions. Sites listing online research studies attracted a total of 496 people (6.4%) to the website. An additional 277 people (3.6%) were attracted to the study through information listed on three cannabis-related sites. This suggests that sites listing online research studies are a profitable avenue for recruitment: readily accessible, and participants recruited with very little effort required from the researcher.

Google AdWords. A total of 4,301 people (55.5%) were attracted to the study through the Google AdWords campaign. The total number of impressions (i.e., number of times the advertisement appeared on a website) is listed for each keyword in Table 2.3. Also listed in

Table 2.3, are the numbers of clicks recorded for each keyword, the click-through-rate (CTR; number of times the advertisement was clicked as a percentage of the total number of impressions), and the average position of the advertisement on web pages. The 'search total' refers to Google keyword searches, while the 'content total' refers to all other placements of the advertisement.

Table 2.3

Keywords Utilized Through Google AdWords

Keyword	**Total clicks**	**Impressions**	**CTR**	**Average position**
Bongs	153	16,844	0.9 %	1.5
Cannabis	1,171	56,010	2.0 %	1.6
Cannabis butter	2	273	0.7 %	1.0
Cannabis seeds	81	8,186	0.9 %	2.2
Ganja	35	2,249	1.5 %	1.1
Growshops	0	22	0.0 %	3.5
Hash	122	8,640	1.4 %	2.0
Hash brownies	1	875	0.1 %	1.2
Hash cookies	4	277	1.4 %	1.1
Hash oil	2	1,066	0.1 %	2.5
Hashish	24	2,764	0.8 %	1.1
Headshops	10	864	1.1 %	2.0
Joint rolling	2	737	0.2 %	1.1
Joints	43	9,002	0.4 %	2.7
Marihuana	44	2,465	1.7 %	1.9
Marijuana	1,464	145,528	1.0 %	1.5
Spliffs	22	1,067	2.0 %	1.8
Search Total	3,180	256,873	1.2 %	1.8
Content Total	1,121	250,441	0.4 %	2.9
TOTAL	**4,301**	**507,314**		

Visits to the Website

The amount of time visitors spent on the website is provided in Figure 2.3. The vast majority (73%) of people accessing the site stayed for less than 15 minutes. The minimum amount of time to complete the questionnaire was approximately 20 minutes, therefore, it is evident that the majority of people accessing the website did not complete the questionnaire.

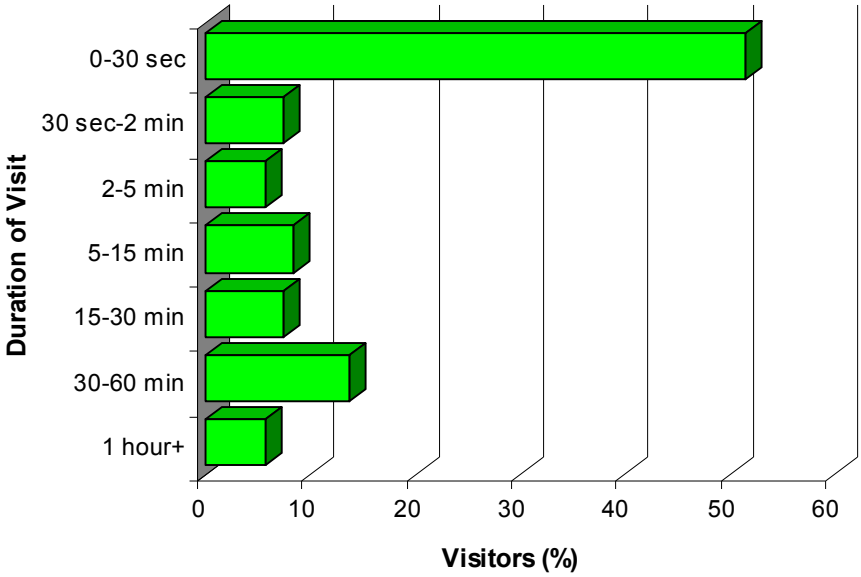

Figure 2.3: Duration of visits to the website

Figure 2.4 displays individual progression through the pages of the website by the percentage of people who accessed the site. The data points displayed in this Figure are for pages of the questionnaire that were to be completed by all participants. It is clear that more than half (54%) of those accessing the website did not proceed beyond the first page, which discussed the contents of the questionnaire and its purpose.

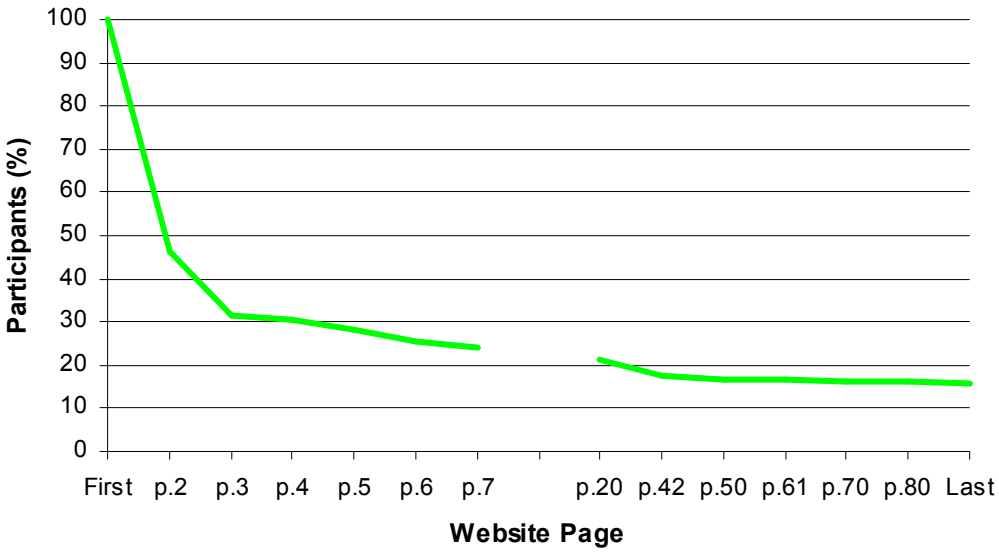

Figure 2.4. Percentage of participants accessing pages of the questionnaire

The percentage of people not progressing beyond the first page of the website may be an issue of site design, in that there was a large amount of information included on the front page, which may have been a deterrent to some people. Alternatively, it may have been due to the use of novel recruitment methods, in that people were attracted to the site without having a clear idea of the content or purpose of the research. This would particularly apply to individuals accessing the site through Google advertisements, where very little information was available before reaching the site.

This possibility is supported by the duration of visit data which indicates that the percentage of visitors staying less than 30 seconds increased from 39% in July to 55% in September, 2005, when Google AdWords were utilized. However, it is also important to note that approximately 20% of visits to the site were by people who had accessed the site previously. Therefore, it is probable that some of the visits lasting less than 30 seconds were from people who looked at the site and decided to return later to take part in the questionnaire. Data relating to the number of visitors who added the site to their Internet

browser bookmarks file may shed some light on this possibility: In July, 5.3% of visitors bookmarked the website, in August it was 37.3% of visitors, rising to 48.3% in September, 2005.

It is striking that, of the 46% of visitors to the site who started the questionnaire, a third failed to progress beyond page 2 of the website (the first page of the questionnaire), and 52% of those starting the questionnaire had left the site by page 7 (the first page of Section 4: Questions about Cannabis). Participant feedback received through online forum postings, suggests that this was probably partially due to the length of the survey, and issues relating to questionnaire design. The initial pages of the questionnaire consisted of items relating to psychopathology and cognitive function. The positioning of these items at the beginning of the questionnaire seemed to contribute to the unease of some potential participants with regard to the motivations behind the research, particularly the belief that the study would be biased towards negative findings. In hindsight, these items may have been better received by participants if placed towards the end of the questionnaire, where potentially sensitive items are often situated (Dillman, 2000). Moreover, the questionnaire may have been more appealing to potential participants if the cannabis-related items had been situated at the beginning. This would have been consistent with the information about the study presented in recruitment messages, and perhaps would have been seen as more relevant to those participating. It is also possible that the individuals who chose to not participate in the study, or did not complete the questionnaire, were different from those who did. For example, individuals experiencing mental health issues or cognitive difficulties may have been less likely to commence or complete the study than individuals without these problems.

Importantly, the final page of the questionnaire was only accessed by 16% of people who visited the website during the data collection period. Thus, 35% of the participants who progressed beyond the first page of the website completed the questionnaire in its entirety.

Screening Participant Data

IP Addresses

All accesses to the website were logged by time, date and IP address. As discussed previously, there were 7,747 visitors to the site during the data collection period. Of these, 67% (5,177 people) did not commence the questionnaire, thus entered no data. These empty data files were deleted without examination of their IP addresses. All remaining data files were sorted by the logged IP addresses and time and date stamping, to allow for thorough examination of the data files for multiple accesses to the site. This procedure was completed in Microsoft Office Excel (2003), with the data spread over a number of spreadsheets due to the large number of data points per participant.

It was apparent that some IP addresses were attached to multiple data files. Closer examination of these data files indicated a number of reasons for this situation. First, some participants had started the questionnaire twice, generally entering the same, or similar, data on the first page or two, although sometimes this continued further into the questionnaire. In these cases, the earlier of the two data files was incomplete, while the second file continued, and the time differences between when these data files were logged, were small. It is probable that these participants had gone back to check or change answers and, by clicking the continue button a second time, generated another data file. To correct for this, the earlier, incomplete data files were deleted for 13 participants.

The second reason for IP addresses being attached to multiple data files was multiple accesses from the one computer. There were 84 IP addresses attached to two or three data files, although generally logged on different dates or separated by large time differences, on the same day. In these cases, close examination of the data indicated that different participants had accessed the site, most likely from the same computer.

IP addresses attached to more than three data files were investigated further to determine ownership. In seven of these cases, it was possible to determine that the IP addresses were linked to internet service providers (ISP), such as AOL. It is probable that participants were accessing the ThC-X site using a dial-up connection through these ISPs, thus having the same IP address logged, although using different computers. The final IP address attached to multiple data files was for The University of New England. This indicated that a number of university computers were used to access the website, and was probably related to the participation of first year UNE psychology students.

Exclusions

A total of 2,557 data files remained after screening IP addresses. A further 1,568 (61%) data files were excluded from the main study analyses (as detailed below), leaving 989 (39%) data files.

Under 18 years old. Due to constraints placed on the study by the Human Research Ethics Committee of the University of New England, data from participants under the age of 18 years was excluded. There were 225 (9%) participants in this age category.

Dropouts. The questionnaire was commenced but not completed by 1,149 (45%) participants. Data from these participants was excluded.

Incomplete data files. If a participant failed to answer key questions (e.g., demographics, psychopathology and cognitive functioning measures), their data was excluded from further analysis. A total of 130 (5%) data files were excluded for this reason.

Brain injury. Participants who reported having sustained a serious head injury at any time in the past were excluded from further analyses. This decision was based on the possibility of confounding results in relation to cognitive functioning. A total of 29 (1%) participants were excluded on this basis.

Schizophrenia/psychosis. Participants who reported a diagnosis of schizophrenia or psychosis were also excluded from the main study analyses. This decision was based the

inability of the researched to verify the diagnoses and also due to the objectives of the present study, specifically, to investigate a non-clinical population of cannabis users. There were 33 (1%) participants in this category.

Summary

The 11 week data collection period resulted in 7,747 visits to the website. Of these visits, approximately 16% (1,239) culminated in a completed questionnaire. After exclusions, there were 989 participants remaining in the study. Notably, the vast majority of visitors to the sites came by way of Google AdWords. However, this recruitment method did not result in an equivalent quantity of questionnaire completions. Rather, it was traditional techniques such as rapport building with potential participants that seemed to be most successful in attracting visitors and gaining completed questionnaires. Nevertheless, without the utilisation of Internet technology it would not have been possible to build rapport with such a large number of people in such a short period of time.

As noted earlier, it was not possible to evaluate how successful the email 'snowballing' campaign was in attracting people to the website. While this aspect of the study was overlooked during the website design and participant recruitment periods, it could have been remedied through assigning different domain names for website access from each different recruitment mode. The resulting information would have been interesting; particularly to see if a call for research participation could generate a similar response as evident in viral marketing campaigns. If this is possible, the ability to recruit broad sections of the Internet-using population would be greatly increased through the uptake of such recruitment campaigns. However, as with the Google AdWords, such a campaign may result in many website visits without the corresponding questionnaire completions, due to the lack of engagement between potential participants and the researcher.

More site visits may have been converted into actual completed questionnaires if the sections participants perceived as being the most relevant to them were placed at the beginning of the questionnaire. Namely, individuals recruited on the basis of their cannabis use had to progress through six pages of the questionnaire before they encountered the first cannabis-related question; only 24% of people starting the questionnaire reached this page. Conversely, as the website was so clearly focused on cannabis use (e.g. name of website, site aesthetics), non users and very occasional users may not have received enough assurance that their participation was desired, thus contributing to the difficulty in recruiting participants outside of the cannabis-using culture. It was always assumed, erroneously in the end, that frequent cannabis users (especially daily users) would be the most difficult group to access and engage in the study.

In spite of these issues, the main factor implicated in the low rate of questionnaire completion was the large number of items and, thus, the time necessary to complete the questionnaire. If questionnaire completion had been the most important consideration in the present study it would have been beneficial to keep the completion time to 15 minutes or less, with a length of less than 7 pages. However, such a substantially shorter questionnaire would not have accommodated the broad range of information that was required to address the objectives under investigation in the present study.

A NOTE ON THE STUDY DATA & ANALYSES

A large number of variables were investigated in this study; they are summarised in a table at the end of each chapter, as relevant. Below is an overview of the data screening and analytic procedures employed by the researcher, and the a priori decisions made regarding the data analyses. Unless otherwise noted, these procedures and decisions were implemented for all data and analyses reported in the following results chapters.

Normality& Outliers

The normality of all variables was assessed, with descriptive statistic provided in the relevant Appendix. In some cases it was deemed necessary to collapse continuous variables into broader categories to improve the normality; this has been noted when applicable. Variables were also checked for univariate outliers, while screening for multivariate outliers was undertaken where appropriate. When outliers were detected, analyses were run both including and excluding these cases to determine if the outliers influenced the results. In no instances were outliers found to have an effect, thus the analyses reported in this thesis included any outliers.

A Priori Decisions & Statistical Analyses

All correlation results reported in the following chapters are Pearson Product-Moment correlation coefficients. Tukey's Honestly Significant Difference (HSD) test was employed for post hoc analyses when analysis of variance (ANOVA) results indicated a significant group difference requiring further investigation. Additionally, regression analyses completed on the data were linear stepwise multiple regressions.

A conservative alpha level of .01 was employed for all significance test given the large sample size and the considerable number of analyses that were necessary for the present investigation. In addition, the eta-squared statistic has been presented as an index of effect

size for ANOVA results, while squared semipartial correlations are reported for the multiple regression results. All analyses were completed in SPSS 14.0 for Windows, while figures were prepared in Microsoft Excel (2003).

Age and gender differences were investigated for all everyday functioning variables and for the cannabis use and lifestyle variables that were investigated in relation to the everyday functioning variables. This decision was primarily based on past research findings indicating age and gender differences in relation to both cannabis use factors and psychopathology. Gender differences have also been reported for a number of the individual and environmental factors under investigation (e.g. other substance use, sexual abuse), while age effects were expected in relation to variables related to life phases (e.g., level of education, marital status). To simplify the investigation of age differences, participants were categorized into one of five age groups for analyses: teenagers (18-19 years; N = 190; 39 % female; coded '1'); early twenties (20-23 years; N = 216; 38 % female; coded '2'); mid to late twenties (24-29 years; N = 213; 39 % female; coded '3'); thirties (30-40 years; N = 189; 41 % female, coded '4'); and over 40 years of age (N = 181; 30 % female; coded '5'). Further, females were coded '1', and males, '2', unless otherwise noted.

CHAPTER 3

THE PARTICIPANTS I: CURRENT LIFESTYLE

Introduction

The first objective of the present study is to describe the hidden population of cannabis users; that is, the individuals who use cannabis without tending to come to the attention of treatment services. This objective is addressed in this and the next chapter; with the 989 study participants and their current lifestyles described below, and their childhood lifestyles explored in Chapter 4. It is hypothesised that a large degree of heterogeneity will be evident in this population. As noted in Chapter 1, unless the heterogeneity of cannabis users is understood we cannot make sense of the individual differences in outcomes and use-related issues that are evident in the general population, such as the impact of cannabis use on the everyday functioning of users. Further, the information covered in this chapter will allow the participants' cannabis use to be viewed within the context of their current life.

The examination of demographic and current lifestyle factors is considered an important aspect in the overall aim of understanding the sample population due to the often reported links between these factors and cannabis use. To summarise the literature, cannabis users are more likely than nonusers to be young (e.g., Roeloffs, Wells, Ziedonis, Tang, & Unutzer, 2002) males (e.g., Coffey, Carlin, Lynskey, Li, & Patton, 2003) with low levels of education (e.g., Fergusson, Horwood, & Beautrais, 2003) who smoke tobacco (e.g., Rey, Sawyer, Raphael, Patton, & Lynskey, 2002), engage in hazardous alcohol use (e.g., McGee, Williams, Poulton, & Moffitt, 2000), use other illicit drugs (e.g., Fergusson, Horwood, & Swain-Campbell, 2002), and have sensation-seeking personality traits (e.g., Palmgreen, Donohew, Lorch, Hoyle, & Stephenson, 2001). While individuals who progress to cannabis dependence are more likely than non-dependent users to have left school early (e.g.,

Fergusson et al., 2003) and be currently single and unemployed (e.g., Teesson, Hall, Lynskey, & Degenhardt, 2000). Thus, if the demographic and lifestyle factors that have been linked to cannabis use in the literature are in fact risk factors for use, we would expect these issues to be over represented in the present study sample in comparison to general population levels. Further, it could be expected that participants more severely affected by such risk factors are likely to be heavier users of the substance, have used for longer durations, and be more dependent, than unaffected participants. This premise will be investigated in Chapter 7.

The first section of this chapter provides a demographic profile of the participants, and also incorporates associated information describing environmental aspects of the participants' current lifestyle. Individual factors, such as substance use, sensation seeking, and health problems are examined in section two of this chapter. The final section of the present chapter provides a summary of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample population in context, both in relation to cannabis-using populations and the general population.

Demographic Profile

Age and Gender

The final participant sample consisted of 372 (38%) females and 617 (62%) males, ranging from 18 to 73 years of age. The mean age of the participants was 29.6 years (SD = 11.7), with females (M = 28.84, SD = 11.11; range: 18-73 years) slightly younger on average than males (M = 30.14, SD = 12.00; range: 18-68 years). This age difference was not significant: $F(1, 988) = 2.86$, $p = .091$, $\eta^2 = .003$ (see Figure 3.1 and Appendices D1 & D2).

As noted previously, participants were categorized into one of five age groups for use in future analyses: teenagers (18-19 years; N = 190; 39% female; coded '1'); early twenties (20-23 years; N = 216; 38% female; coded '2'); mid to late twenties (24-29 years; N = 213;

39% female; coded '3'); thirties (30-40 years; *N* = 189; 41% female, coded '4'); and over 40 years of age (*N* = 181; 30% female; coded '5'). Females were coded '1', and males, '2'.

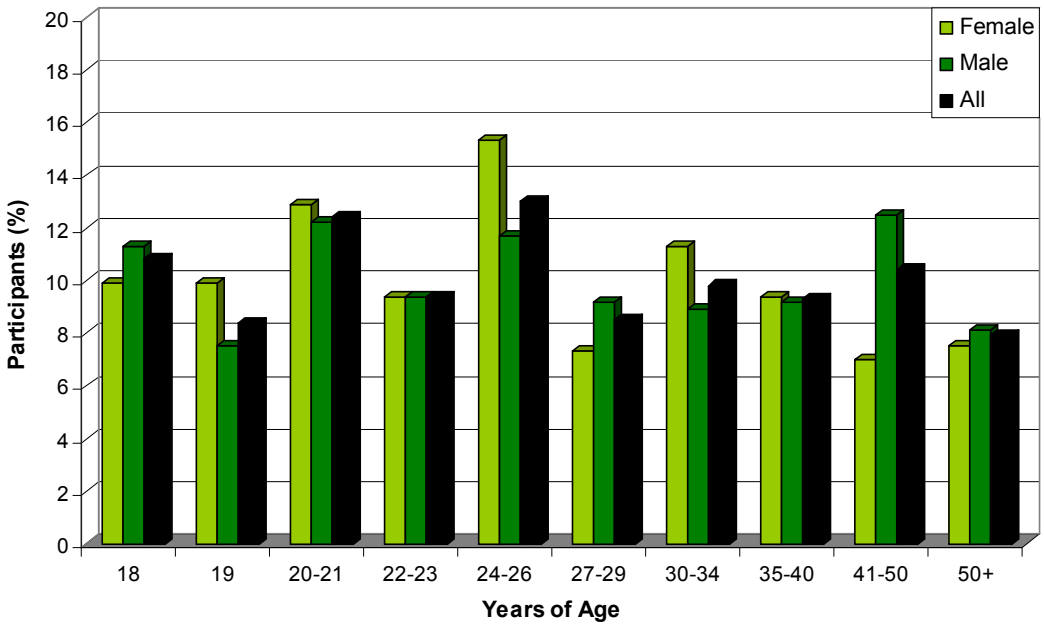

Figure 3.1. Distribution of participants by age and gender

Education and Employment

Some post-school qualifications had been attained by the majority of participants (72%), with 17% completing an undergraduate degree and 12% a postgraduate degree. Approximately half of participants were employed (51%), a third (34%) was studying, and the remaining 15% of participants were unemployed (see Appendix D3). Of the 28% of participants with no post-school qualification (particularly the 8% who had not completed high school), many were current students.

The range of occupations reported by participants was diverse, with the highest proportion (15%) of participants reporting professional work, followed by 7% working in retail, and 5% in customer service (5.4%), administration (5.2%), another skilled job (5.2%), or hospitality (5.0%). While both males and females were most likely to report being

professionals, females were more likely than males to work in retail, hospitality, and administrative positions, while males were more likely than females to be employed as health workers, technicians, and in unskilled positions (see Appendix D4).

The highest level of education attained by the participants was scored on a 5-point scale, from 1 = 'less than high school' to 5 = 'postgraduate qualifications'. The participants' mean score on this scale was 3.05 (SD = 1.07). Unsurprisingly, a two-way ANOVA indicated a large age effect ($F[4, 988] = 49.54$, $p < .001$, $\eta^2 = .164$), with teenagers and participants in their early twenties having attained a significantly lower level of education than older participants. No gender or interaction effects were indicated (see Appendices D5-D7).

The participant's reported occupation was used to develop a proxy socioeconomic status (SES) variable. This was achieved by grouping the job categories into 5 SES bands, where 1 = 'lowest SES' (e.g. unskilled labour) and 5 = 'highest SES' (e.g. professionals), using the guidelines employed by the NSW Department of Education. The mean participant score for this proxy SES variable was 2.41 (SD = 1.44). As would be expected, older participants tended to have higher proxy SES scores than younger participants, with the ANOVA indicating a medium age effect: $F(4, 988) = 14.72$, $p < .001$, $\eta^2 = .056$. A small gender effect was also evident, with female participants (M = 2.11, SD = 1.32) assigned a lower mean proxy SES score than male participants (M = 2.59, SD = 1.48): $F(1, 988) = 29.83$, $p < .001$, $\eta^2 = .026$. In addition, a small interaction effect was indicated, due to female teenagers scoring higher than male teenagers $F(4, 988) = 5.26$, $p < .001$, $\eta^2 = .018$ (see Figure 3.2 and Appendices D8-D10).

While a higher proportion of the female participants (18%) than of the male participants (14%) reported current unemployment, the gender effect was very small ('employed' = 0; 'unemployed' = 1): $F(1, 988) = 6.81$, $p = .009$, $\eta^2 = .007$. In contrast, there was a medium age effect, with participants over the age of 40 years more likely to be

unemployed than participants aged under 30: $F(4, 988) = 14.72$, $p < .001$, $\eta^2 = .056$ (see Appendices D11-D13).

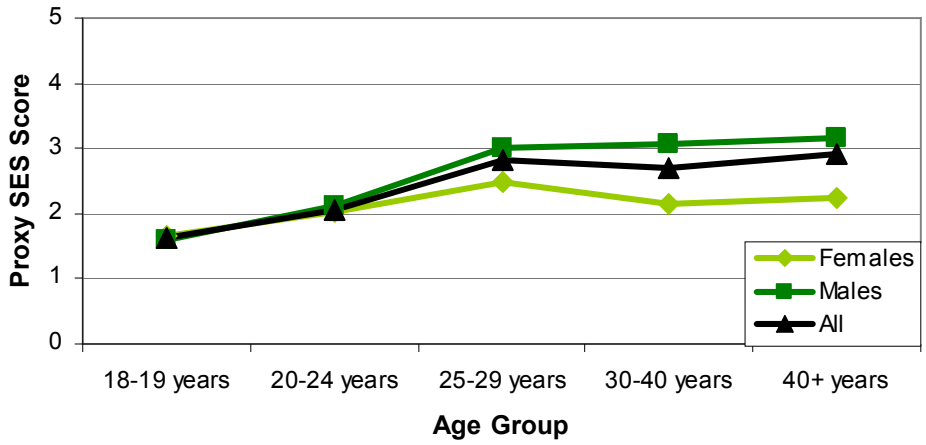

Figure 3.2. Proxy SES by age and gender

Living Arrangements

The majority of participants were single/never married (61%) and did not have children (70%). Almost a third of participants (30%) were married or in de facto relationships, while 9% were divorced, separated or widowed. The most common living arrangements reported by participants was cohabitation within a family grouping where they were a parent or partner (42%) or a child (i.e., with their parent/s; 25%). Nineteen percent of participants were living communally with friends (13%) or in dorm-style accommodation (6%), while 12% lived alone (see Appendix D14).

While a higher proportion of the male participants (61%) than of the female participants (54%) reported being single, the gender effect was very small ('partnered' = 0; 'single' = 1): $F(1, 988) = 6.89$, $p = .009$, $\eta^2 = .005$. Unsurprisingly, there was a large age effect, with the proportion of single participants decreasing steadily with increased age: $F(4, 988) = 63.92$, $p < .001$, $\eta^2 = .201$ (see Appendices D15-D17).

Country and Region of Residence

Almost half of the participants resided in the USA (47%). Next most common, with 20% of participants each, were Australia/New Zealand (NZ) and the UK/Ireland, followed by Canada (8%), with participants residing in other countries making up 6% of the total sample. The majority of participants lived in a suburban area or country town (51%), while 28% were situated in urban areas and 21% in rural or remote regions (see Appendix D16). Region of residence was scored on a 3-point scale, where 'urban' = 1, 'suburban are/country town' = 2, and 'rural/remote' = 3. Using this scoring system, the mean score for the participants was 1.93 (SD = 0.70). A two-way ANOVA indicated a small age effect (F[4, 988] = 5.30, $p < .001$, $\eta^2 = .021$), with participants in their mid-late twenties (M = 1.79, SD = 0.65) and thirties (M = 1.84, SD = 0.75) tending to live in more densely populated areas than participants aged over 40 years of age (M = 2.07, SD = 0.68). Teenagers (M = 2.05, SD = 0.67) also lived in more sparsely populated areas than participants aged in their mid-late twenties. No gender or interaction effects were indicated (see Appendices D19-D21).

Current Individual Factors

Three of the types of current individual factors that were assessed in this study are discussed below. These are the use of licit and illicit substances, sensation seeking personality traits, and self-identified health problems. Other individual factors are discussed in later chapters, with current patterns of cannabis use examined in Chapter 5, psychological wellbeing investigated in Chapter 9, and cognitive functioning covered in Chapter 10. Hence, the latter aspects of the participants' current lifestyles will not be discussed in the present section.

Substance Use

Substance use-related questionnaire items tapped both lifetime and current usage of both licit and illicit drugs, including the use of prescription and over-the-counter medication for non-medical purposes. In all, participants were questioned specifically about their use of 20 substances, however; only the most commonly used substances will be discussed in detail here (see Table 3.1 for full list and usage statistics). As noted previously, current levels of cannabis use are discussed in Chapter 6.

Alcohol Use

The vast majority of participants (99.6%) had used alcohol at some point in their lives; however, 14% of participants had not consumed alcohol in the previous year. Most commonly, participants consumed alcohol at least weekly (44%), followed by monthly (21%), and then less than monthly (19%). Approximately 2% of participants consumed alcohol on a daily basis (see Table 3.1).

Age and gender differences were investigated in relation to frequency of use in the previous 12 months, which was scored as follows: 1 = 'no use'; 2 = 'less than monthly use'; 3 = 'monthly use'; 4 = 'weekly use'; 5 = 'use on most days'; 6 = 'daily use'. With this scoring system, the participants' mean alcohol frequency score was 3.11 (SD = 1.27). A two-way ANOVA indicated a small age effect: $F(4, 979) = 5.55$, $p < .001$, $\eta^2 = .022$. A post hoc Tukey's HSD analysis indicated that participants in their teens (M = 3.21; SD = 1.11), early twenties (M = 3.25; SD = 1.13), and thirties (M = 3.29; SD = 1.31) consumed alcohol significantly more frequently than participants who were over 40 years of age (M = 2.73; SD = 1.47). No significant gender or interaction effects were evident (see Figure 3.3 and Appendices D22-D24).

Tobacco Use

The tobacco use questionnaire items specifically instructed participants to report only tobacco consumed in cigarette, cigar, pipe or chewing forms. Thus these results do not include the use as 'spin', that is, tobacco mixed in with cannabis before consumption. The use of tobacco as 'spin' will be discussed in Chapter 6, in conjunction with current patterns of cannabis use. Almost all participants (95%) had tried tobacco at some point in their lives. Thirty-five percent of participants had not used tobacco in the previous year, while a further 35% were daily smokers (see Table 3.1). Using the same scoring system as for alcohol consumption, the participants' mean tobacco frequency score was 3.47 (SD = 2.20). A two-way ANOVA indicated a significant, but small, age effect ($F[4, 979] = 4.21$, $p = .002$, $\eta^2 = .017$), with the post hoc Tukey's HSD analysis indicating that participants in their thirties (M = 3.88; SD = 2.26) consumed tobacco more often than participants who were over 40 years of age (M = 2.86; SD = 2.30). No significant gender or interaction effects were evident (see Figure 3.3 and Appendices D25-D27).

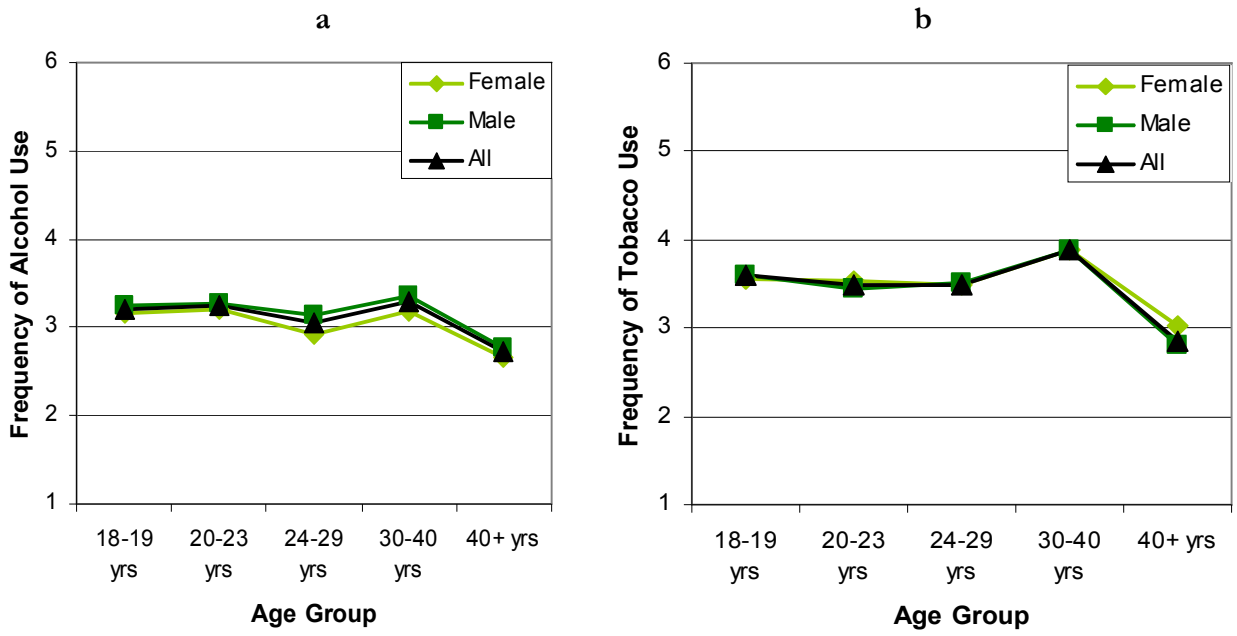

Figure 3.3: Frequency of alcohol (a) and tobacco (b) use by age group and gender.

Table 3.1

Past and Current Substance Use

	Never Used		**Not in Previous 12 months**		**Less than Monthly**		**Monthly**		**Weekly**		**Daily**	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
Alcohol	4	0.4 %	134	13.5 %	189	19.1 %	211	21.3 %	434	43.9 %	17	1.7 %
Tobacco	47	4.8 %	305	30.1 %	98	9.9 %	48	4.9 %	143	14.5 %	348	35.2 %
Illicit substances												
Cannabis	44	4.4 %	150	15.2 %	85	8.6 %	78	7.9 %	346	35.0 %	286	28.9 %
Ecstasy	594	60.1 %	234	23.7 %	144	14.6 %	16	1.6 %	1	0.1 %	0	0.0 %
Amphetamines	580	58.6 %	183	18.5 %	85	8.6 %	38	3.8 %	54	5.5 %	49	5.0 %
Methylamphetamines	797	80.6 %	89	9.0 %	33	3.3 %	15	1.5 %	30	3.0 %	25	2.5 %
Cocaine	571	57.7 %	181	18.3 %	107	10.8 %	41	4.1 %	52	5.3 %	37	3.7 %
Heroin	897	90.7 %	58	5.9 %	13	1.3 %	3	0.3 %	6	0.6 %	12	1.2 %
Acid	559	56.5 %	171	17.3 %	133	13.4 %	59	6.0 %	60	6.1 %	7	0.7 %
Inhalants	675	68.3 %	158	16.0 %	95	9.6 %	31	3.1 %	19	1.9 %	11	1.1 %
Crack	850	85.9 %	99	10.0 %	18	1.8 %	3	0.3 %	9	0.9 %	10	1.0 %
GHB	881	89.1 %	73	7.4 %	19	1.9 %	5	0.5 %	6	0.6 %	5	0.5 %
Ketamine	859	86.9 %	100	10.1 %	17	1.7 %	4	0.4 %	5	0.5 %	4	0.4 %
PCP	885	89.5 %	80	8.1 %	11	1.1 %	1	0.1 %	8	0.8 %	4	0.4 %
Solvents	862	87.2 %	98	9.9 %	15	1.5 %	1	0.1 %	5	0.5 %	8	0.8 %

Table 3.1 continued

	Never Used		**Not in Previous 12 months**		**Less than Monthly**		**Monthly**		**Weekly**		**Daily**	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
Herbal stimulants	820	82.9 %	112	11.3 %	43	4.3 %	5	0.5 %	4	0.4 %	5	0.5 %
Magic Mushrooms	486	47.3 %	240	24.3 %	230	23.3 %	34	3.4 %	12	1.2 %	5	0.5 %
Kava	833	84.2 %	122	12.3 %	19	1.9 %	3	0.3 %	8	0.8 %	4	0.4 %
Other natural hallucinogen	810	81.9 %	101	10.2 %	60	6.1 %	10	1.0 %	3	0.3 %	5	0.5 %
Other illicit substance	822	83.1 %	72	7.3 %	54	5.5 %	15	1.5 %	8	0.8 %	18	1.8 %
Over-the-counter/ prescription medications (used for non-medical purposes)												
Analgesics	673	68.0 %	134	13.5 %	119	12.0 %	27	2.7 %	20	2.0 %	16	1.6 %
Tranquillisers	755	76.3 %	122	12.3 %	82	8.3 %	15	1.5 %	9	0.9 %	6	0.6 %
Barbiturates	885	89.5 %	67	6.8 %	25	2.5 %	4	0.4 %	4	0.4 %	4	0.4 %
Methadone (non-maintenance)	930	94.0 %	40	4.0 %	6	0.6 %	4	0.4 %	3	0.3 %	6	0.6 %
Other prescription medication	871	88.1 %	57	5.8 %	35	3.5 %	9	0.9 %	11	1.1 %	6	0.6 %

Other Substance Use

Illicit substance use. Other than cannabis, 'magic mushrooms' was the only illicit substance used at least once by more than half of the participants (53%). Acid was the next most commonly used substance (43%), followed by cocaine (42%), and amphetamines (41%). A total of 40% of participants had tried ecstasy, but less than 15% of participants had tried GHB, PCP, solvents, ketamine, or crack cocaine (see Table 3.1).

Past year use of these illicit substances was fairly uncommon in this study, with seven of the 20 substances used by less than 5% of participants in the previous 12 months. Further, modal consumption of the four most commonly used substances (i.e., magic mushrooms, acid, cocaine, and amphetamines) was 'less than monthly'. Of all illicit substances, amphetamine (5%) was the most likely to be used daily, however, ecstasy was the only substance with no daily users (see Table 3.1).

Use of prescription and over-the-counter medications. Participants were asked to report their consumption of prescription and over-the-counter medications where such use was for non-medical purposes. The type of medication most commonly used for non-medical purposes were analgesic products (32%), followed by tranquillisers (24%) and barbiturates (10%). With regards to use in the previous year, analgesics had been used for non-medical purposes by 18% of participants, with approximately 9% of these participants doing so on a daily basis. Approximately 11% of participants had undertaken non-medical use of tranquillisers in the previous year, while current levels of use was lower for all other medications assessed (see Table 3.1).

Poly-Substance Use

Poly-substance use was also assessed in the participants. It is evident, from Table 3.2, that the majority of participants (77%) had experimented quite widely, with one-third of participants (39%) having tried at least six or more of the 22 substances. Similarly, one-third

of participants reported poly-substance use in the previous month, with most reporting the use of only one or two illicit drugs (excluding cannabis use) within this timeframe.

A poly-substance use variable was developed to summarise psychotropic substance use in the previous month. This variable covered the use of 17 illicit drugs and 7 medications, and was found to have good internal consistency reliability: $\alpha = .79$. However, it was deemed necessary to convert the variable from a continuous (scoring range: 0-24) to categorical variable to improve normality statistics (see Appendix D28). Thus, the following scale was employed: 0 = 'no substances'; 1 = '1-2 substances'; 2 = '3-4 substances'; 3 = '5-8 substances'; and, 4 = '9 or more substance'.

The participants' mean score for this poly-substance use variable was 0.82 (SD = 1.11). A two-way ANOVA investigating age and gender differences in current poly-substance use indicated a significant interaction between the two variables: $F(4, 979) = 4.84$, $p = .001$, $\eta^2 = .019$. This interaction was evident because female teenagers ($M = 0.76$, $SD = 1.08$) consumed a greater number of substances on average than male teenagers ($M = 0.51$, SD = 0.85); while males reported greater poly-substance use than females for all other age groups. However, the overall gender effect was small ($F[1, 979] = 6.89$, $p = .009$, $\eta^2 = .007$). No age effects were indicated (see Figure 3.4 and Appendices D29 & D30).

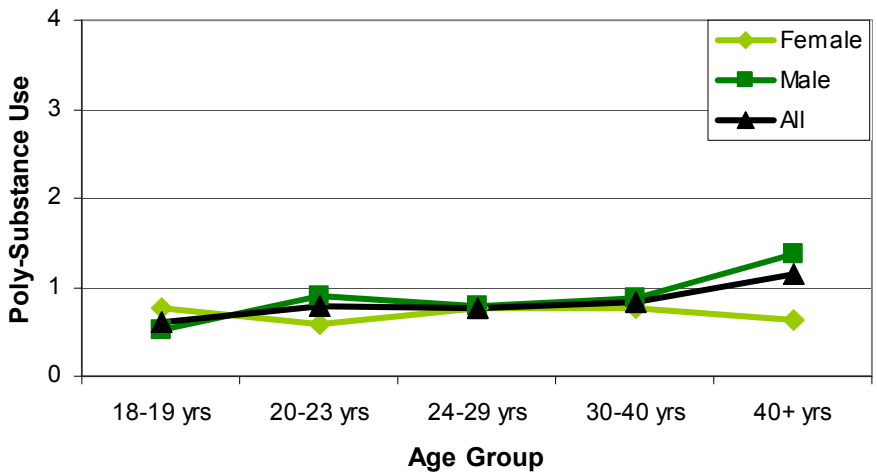

Figure 3.4: Poly-substance use by age group and gender.

Table 3.2

Number of Participants Consuming Multiple Substances

	1-2 Substances		3-5 Substances		6-9 Substances		10+ Substances		Total	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
Illicit Drugs*										
Ever Used	152	15.4 %	229	23.2 %	220	22.4 %	115	11.6 %	716	72.4 %
Use in Previous Month	223	22.5 %	88	8.9 %	18	1.8 %	5	0.5 %	334	33.8 %
Prescription/over-the-counter medications†										
Ever Used	235	23.8 %	137	13.9 %	3	0.3 %			475	48.0 %
Use in Previous Month	72	7.3 %	14	1.4 %	0	0.0 %			86	8.7 %
All Substances*										
Ever Used	156	15.8 %	217	21.9 %	205	20.7 %	180	18.2 %	758	76.6 %
Use in Previous Month	232	23.5 %	99	10.0 %	26	2.6 %	6	0.6 %	363	36.7 %

* Excluding cannabis
† Used for non-medical purposes

Sensation Seeking

Two short sensation seeking measures were combined to create a single sensation seeking variable for the present study: the Brief Sensation Seeking Scale (BSSS-4) (Stephenson, Hoyle, Palmgreen, & Slater, 2003) and the Sensation Seeking Index (SS2) (Slater, 2003).

The BSSS-4 is a valid and reliable ($\alpha = 0.66$), 4-item measure with a scoring range of 4-20. Participants used a 5-point scale ("strongly disagree' to 'strongly agree') to respond to the following statements: "I would like to explore strange places"; "I like to do frightening things"; "I like new and exciting experiences, even if I have to break the rules"; "I prefer friends who are exciting and unpredictable" (Stephenson et al., 2003). The SS2 is a valid and reliable ($\alpha = 0.83$), 2-item measure rated on a 5-point scale, from 'not at all' to 'very often' (scoring range: 2-10). The two items ask: "How often do you do dangerous things for fun?" and "How often do you do exciting things even if they are dangerous?" (Slater, 2003).

The combined sensation seeking measure has a scoring range of 6-30 and was found to have higher internal consistency in the present sample ($N = 989$, $\alpha = .86$) compared to the two separate measures. A two-way ANOVA was employed to investigate age and gender effects in relation to sensation seeking traits. The results indicated that males ($M = 18.75$, $SD = 4.57$) scored significantly higher than females ($M = 16.49$, $SD = 5.04$) on sensation seeking, with a medium effect size: $F(1, 979) = 63.46$, $p < .001$, $\eta^2 = .057$. The analysis indicated a slightly stronger age effect, with sensation seeking scores decreasing progressively with increased age: $F(4, 979) = 18.18$, $p < .001$, $\eta^2 = .065$ (see Figure 3.5 and Appendices D31-D33).

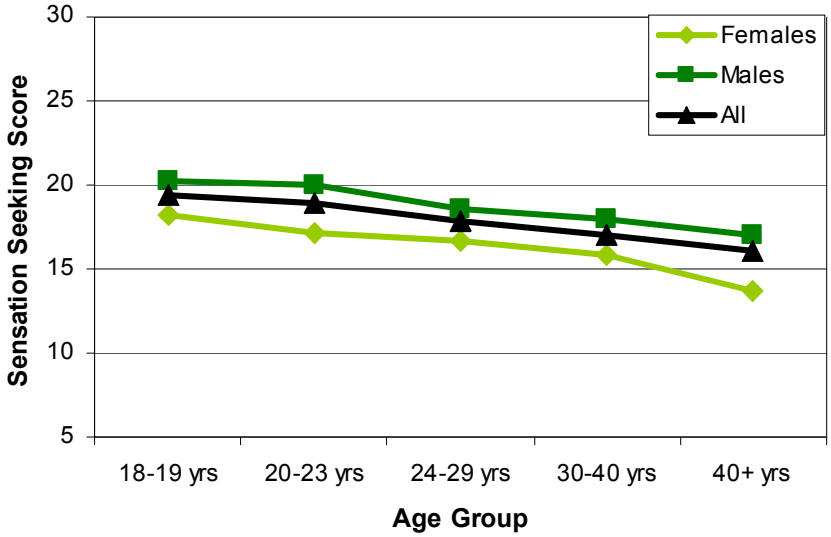

Figure 3.5: Sensation seeking by age group and gender

Health & Sleep Problems

Participants were asked if they had experienced sleep problems or health problems (see Table 3.3). These questionnaire items were answered via a 6-point scale where: 0 = 'no, never'; 1 = 'yes, but this was never really an issue for me'; 2 = 'yes, but this is not an issue for me now'; 3 = 'yes, this is sometimes an issue for me'; 4 = 'yes, this is often an issue for me'; and, 5 = 'yes, this is always an issue for me'.

Sleep problems were the most commonly reported problem, with almost half the participants (46%) stating that they experienced difficulties in this area at least sometimes. More pertinently, 20% participants reported being often or always affected. The next two most commonly reported problems, that participants experienced at least sometimes, were chronic pain (17%) and Chronic Fatigue Syndrome (CFS; 13%). A total of 9% and 5% of participants, respectively, experienced these issues often or always (see Table 3.3). A high level of comorbidity was evident, particularly with sleep problems. Overall, 208 (21%)

participants reported being often or always affected by at least one problem, hence 79% of the sample were relatively unaffected.

Table 3.3

Health Problems Reported by Participants, by Severity

	Sometimes Affected		**Often Affected**		**Always Affected**		**Total Affected**	
Problems	*N*	%	*N*	%	*N*	%	*N*	%
Sleep problems	264	26.7 %	112	11.3 %	83	8.4 %	459	46.4 %
Health problems								
Chronic pain	76	7.7 %	38	3.8 %	52	5.3 %	166	16.8 %
CFS	77	7.8 %	25	2.5 %	24	2.4 %	126	12.7 %
Chronic illness	29	2.9 %	12	1.2 %	37	3.7 %	78	7.9 %
Eating disorder	18	1.8 %	13	1.3 %	0	0.0 %	60	6.1 %
Brain injury	29	2.9 %	0	0.0 %	0	0.0 %	29	2.9 %
Long-term illness	11	1.1 %	3	0.3 %	15	1.5 %	29	2.9 %
Cancer	6	0.6 %	0	0.0 %	3	0.3 %	9	0.9 %
Epilepsy	3	0.3 %	1	0.1 %	4	0.4 %	8	0.8 %
Other problem	10	1.0 %	12	1.2 %	39	3.9 %	61	6.2 %

Health Problems. The eight questionnaire items assessing health problems were incorporated into a new variable (scoring range: 0 – 24; $N = 989$, $\alpha = .65$). To improve normality (see Appendix D34), these scores were recoded to: 0 = 'no health problems'; 1 = 'very low'; 2 = 'low'; 3 = 'moderate'; 4 = 'high' level health problems. The mean health problems score was 0.81 ($SD = 1.16$). A two-way ANOVA indicated small gender ($F[1, 988] = 21.36$, $p < .001$, $\eta^2 = .021$) and age ($F[4, 988] = 7.16$, $p < .001$, $\eta^2 = .028$) effects, with females ($M = 1.01$, $SD = 1.72$) reporting more health problems than males ($M = 0.69$, $SD =$

1.08), and participants over 40 years of age (M = 1.09, SD = 1.38) reporting more problems than the teenagers (M = 0.54, SD = 0.93), respectively (see Appendices D35-D37).

Sleep Problems. Sleep problems were coded: 0 = 'no sleep problems'; 1 = 'sometimes affected'; 2 = 'often affected'; 3 = 'always affected'. The mean sleep problems score for the participants was 0.75 (SD = 0.96). A two-way ANOVA indicated small gender effect (F[1, 988] = 9.27, p = .002, η^2 = .009), with females (M = 0.86, SD = 1.00) reporting more sleep problems than males (M = 0.75, SD = 0.96). No age or interaction effects were indicated (see Appendices D38 & D39).

Summary & Discussion

Chapter Summary

The first objective of the present study was to describe the hidden population of cannabis users within the general population. The population targeted for recruitment to this study was based on the peak ages for cannabis use (20-29 years) and English-speaking. With the mean age for the participants falling at the higher end of this age range, the recruitment strategy was successful in gaining completed questionnaires from the target population. While there was no specific target regarding the gender balance, it is not surprising to have recruited more male than female participants, as most substance use-related research samples are similarly skewed.

It was hypothesised that there would be a large degree of heterogeneity evident in the participant sample in relation to their demographic profile and current lifestyle factors. This premise was supported by the data provided in the present chapter, where it is evident that the participants are quite varied. For example, there was a large age range (18-73 years), with participants from many different stages of life, as reflected in the participants' levels of education, proxy SES, and marital status. The region of residence of the participants also

indicated phase of life related changes, with teenagers and participants aged over 40 years living in areas of lower population density (e.g., in suburban family homes), in comparison to the participants aged in their twenties and thirties, who tended to live in higher density urban areas. Interestingly, participants over the age of 40 were the most likely to be unemployed.

In relation to individual factors, small age-related differences were evident in relation to alcohol and tobacco use, with older participants using less frequently than younger participants, and health problems, with older participants reporting more problems than younger participants. Further, a wide range of sensation seeking traits was evident in the sample population, with younger male participants having the highest levels and older females the lowest. A number of small gender effects were evident, with female participants having lower levels of proxy SES, higher levels of unemployment, and being more likely to be in a partnered relationship than male participants. Females also reported more health and sleep problems than the males, and were slightly less likely to be poly-substance users.

As a group, the participants were highly educated (72% with post school qualifications, 29% with university degrees) and one-third of the participants were currently students. However, with only half of the participants employed, there was a high level of unemployment (15%) in comparison to usual societal levels in countries such as Australia, the UK and the USA. Further, although the most commonly endorsed occupational area was professional work (high SES), the majority of participants' occupations placed them in moderate or lower proxy SES bands. With regard to interpersonal factors, only 30% were currently partnered, and 30% had dependent children. The participants most commonly used alcohol on a weekly basis, one-third were daily tobacco smokers, and they typically used illicit substances (other than cannabis) monthly. A fifth of the participants reported often or always being affected by a health problem, of which sleep problems were most common.

Comparison Data

Demographic Profile

Table 3.4 provides a comparison of the participants' demographic profile with those from a number of other cannabis research sample populations. The four comparison groups are comprised of three Australian samples (i.e., urban, rural, and treatment-seeking) and participants from an Internet-based study. The urban sample consisted of long-term cannabis users who lived in Sydney. This sample was described initially in articles by Swift, Hall, and Copeland (1998) and Swift, Copeland, and Hall (1998), then followed up by the same researchers a year later (Swift, Hall, & Copeland, 2000). The rural, long-term cannabis users were involved in a study described by Reilly, Didcott, Swift, and Hall (1998) and Swift, Hall, Didcott, and Reilly (1998), while the treatment-seeking cannabis users were described by Copeland, Swift, and Rees (2001). The Internet-based study by Nicholson, White, and Duncan (1999) recruited recreational drug users.

It is evident in Table 3.4 that the participants in the present study are approximately the same age as all but the rural sample, which had the highest mean age. The gender balance of the present sample is also similar to all but the Internet sample, which was extremely skewed towards male gender, although the Internet sample most resembled participants in the present study in relation to level of education. With regard to employment status, it is evident that the present study has a higher percentage of students than the other samples, and it also appears to have a lower level of unemployment than all but the Internet sample. However, many of the studies did not classify participants solely by their main occupation, thus it was possible for the participants to be both a student and employed or unemployed.

With the exception of the urban sample, a total of 42-48% of participants in all of the samples lived with a partner. This is perhaps somewhat related to stage of life, with approximately twice the proportion of the younger urban sample living with friends than for

Table 3.4

Comparison of the Demographic Profile of the Participants with Other Research Sample Populations

	This Study *N* = 989	**Urban Sample** *N* = 200	**Rural Sample** N = 268	**Treatment Sample** *N* = 229	**Internet Sample** *N* = 906
Mean age (*SD*)	30 years (11.7)	28 years (7.5)	36 years (7.5)	32 years (7.9)	31 years (9.3)
Age range	18 – 70+ years	17 – 57 years	-	18 – 59 years	13 – 71 years
% Male	62 %	58 %	59 %	69 %	88 %
Education					
Did not finish high school	8 %	46 %	-	42 %	2 %
Hold post-school qualifications	72 %	60 %	62 %	23 %	74 %
Employment*					
Employed (full or part time)	51 %	58 %	58 %	81 %	97 %
Unemployed	15 %	40 %	43 %	17 %	3 %
Student	34 %	19 %	9 %	5 %	25 %
Living arrangements					
Living with partner/spouse	42 %	32 %	43 %	48 %	48 %
Living alone	12 %	12 %	24 %	-	-
Living with friends	13 %	29 %	-		
Have dependent child/ren	30 %	16 %	57 %	-	-
Live in urban/suburban area	79 %	100 %	29 %	-	-
Main country of residence	47 % USA	100 % Australia	100 % Australia	100 % Australia	78 % USA

* May add to more than 100% as some participants in some studies nominated more than one employment category

the present sample, however 12 % of both of these samples, and 24% of the rural sample, lived alone. Having dependent children is more clearly age-related, with the majority of the older rural sample having children in comparison to under a third of the present sample, and less than a fifth of the younger urban sample.

The characteristics of each of these five samples are likely to be at least partially due to the recruitment methods and study designs employed. All of the participants in the urban, rural, and treatment-seeking samples were Australian and interviewed in person, while the present study and that by Nicholson et al. (1999) accessed international samples via the Internet. In contrast to the present study, the vast majority of Nicholson et al.'s sample resided in the USA. This difference is likely to be due to the calls for participation in the latter study being primarily emailed to groups who were interested in discussing the drug policies of the United States. Nevertheless, when taken as a whole, the demographic profile of the present sample does not appear to differ in any major way from previous samples that had been engaged in cannabis use-related research.

Substance Use

The level of substance use by the participants is compared to population data in Table 3.5. Alcohol was the only substance for which the participants had a similar consumption pattern to the general population; however, the participants were less likely to drink alcohol on a daily basis (2%) than members of the general population in Australia (9%) and the UK (11%). Almost all the participants (95%) in this study had tried tobacco in comparison to approximately half of Australian (47%) and USA (56%) populations. Further, 35% of the participants were daily smokers, while only 17% of Australians and 27% of people in the UK smoke tobacco on a daily basis.

The disparity was even greater for lifetime use of illicit substances. For example, 40% of study participants had used ecstasy, whereas lifetime use in Australia, the USA and the UK

Table 3.5

Comparison of Substance Use by Participants with the Population Levels of use in Australia, the UK, and the USA

	This Study	Australia [a]	USA [b]	UK [c]
Alcohol				
Ever used	99.6 %	90.7 %	72.6 %	-
Use less than weekly	40.4 %	33.5 %	-	-
Use weekly	43.9 %	41.2 %	-	66 %
Use daily	1.7 %	8.9 %	-	11 %
Tobacco				
Ever used	95.2 %	47.1 %	55.8 %	-
Use less than weekly	14.8 %	1.6 %	-	-
Use weekly	14.5 %	1.6 %	-	-
Use daily	35.2 %	17.4 %	-	27 %
Ecstasy				
Ever used	39.9 %	7.5 %	5.0 %	7.3 %
Use in past 12 months	16.3 %	3.4 %	0.9 %	1.8 %
Use in past month	1.7 %	1.3 %	0.2 %	0.8 %
Use weekly	0.1 %	0.5 %	-	-
Amphetamines				
Ever used	41.4 %	9.1 %	8.2 %	11.9 %
Use in past 12 months	22.9 %	3.2 %	1.4 %	1.3 %
Use in past month	14.3 %	1.3 %	0.5 %	0.5 %
Use weekly	10.5 %	0.6 %	-	-
Cocaine				
Ever used	42.3 %	4.7 %	14.3 %	7.5 %
Use in past 12 months	23.9 %	1.0 %	2.5 %	2.6 %
Use in past month	13.1 %	0.3 %	1.0 %	1.2 %
Use weekly	9.0 %	0.2 %	-	-
Heroin				
Ever used	9.3 %	2.3 %	1.5 %	0.7 %
Use in past 12 months	3.4 %	0.3 %	0.2 %	0.1 %
Use in past month	2.1 %	0.1 %	0.1 %	0.1 %
Use weekly	1.8 %	0.1 %	-	-

Table 3.5 continued

	This Study	Australia [a]	USA [b]	UK [c]
Acid				
Ever used	43.5 %		9.5 %	5.4 %
Use in past 12 months	26.2 %		0.3 %	0.2 %
Use in past month	12.8 %		0.1 %	0.1 %
Use weekly	6.8 %		-	-
Inhalants				
Ever used	31.7 %	2.5 %	9.3 %	9.1 %
Use in past 12 months	15.7 %	0.4 %	0.9 %	1.4 %
Use in past month	6.1 %	0.2 %	0.3 %	0.5 %
Use weekly	3.0 %	0.1 %	-	-
Ketamine				
Ever used	13.1 %	1.0 %		1.3 %
Use in past 12 months	3.0 %	0.3 %		0.3 %
Use in past month	1.3 %	0.1 %		0.1 %
Use weekly	0.4 %	< 0.1 %		-
Magic mushrooms				
Ever used	52.7 %			7.1 %
Use in past 12 months	28.4 %			0.6 %
Use in past month	5.1 %			0.1 %
Use weekly	1.7 %			-
Analgesics				
Ever used	32.0 %	-	13.6 %	
Use in past 12 months	18.3 %	3.1 %	5.1 %	
Use in past month	6.3 %	-	2.1 %	
Use weekly	3.6 %	-	-	
Tranquillisers				
Ever used	23.5 %	-	8.7 %	2.9 %
Use in past 12 months	11.3 %	1.0 %	2.1 %	0.4 %
Use in past month	3.0 %	-	0.7 %	0.2 %
Use weekly	1.5 %	-	-	-

[a] 2004 National Drug Strategy Household Survey (AIHW, 2005)
[b] 2006 National Survey on Drug Use and Health (SAMHSA, 2007)
[c] 2006/07 British Crime Survey (Murphy & Roe, 2007)

is below 8%. Similarly, more than half the participants (53%) had used magic mushrooms in comparison to only 7% of the UK population. A similar trend was also evident for the non-medical use of prescription medications, such as analgesics and tranquillisers.

High lifetime usage rates of these substances may simply reflect more extensive experimentation by cannabis users. However, the past year, monthly and weekly usage figures in Table 3.4 indicate that the participants were consuming substances at much higher rates than the general population. For example, one-quarter (24%) of the participants consumed cocaine in the previous year in comparison to less than 3% of the general population, in all three countries. In addition, past month amphetamine use was reported by 14% of the participants, while less than 2% of the general population samples endorsed this same level of use.

In Table 3.6 the participants' substance use is compared to data from other research samples of cannabis users. The Australian urban (Swift, Hall, & Copeland, 1998) and rural (Reilly et al., 1998) samples, and Nicholson et al.'s (1999) Internet sample, were again employed as comparison groups. Additional comparison groups comprised dependent (N = 1111) and non-dependent (N = 1770) daily cannabis users, who participated in an Internet-based study by Looby and Earleywine (2007). Together, these two sample groups had a mean age of 33.0 years (SD = 12.7; range: 18-88 years) and 64% were male.

Lifetime alcohol use was similar, at over 95%, for the four sample populations for which data was available. However, the participants in the present study were more likely to use alcohol on a weekly basis than the Internet sample. The participants' lifetime tobacco use was similar to that of the urban sample, but higher than that of the rural sample. Conversely, the participants were substantially less likely to be regular tobacco smokers, and reported much lower levels of lifetime use for illicit substances, than either of the latter groups. For example, where 90% of the urban and 75% of the rural samples had tried amphetamines at least once, only 41% of the participants in this study had ever used the substance, which was

Table 3.6

Comparison of Substance Use by Participants with Use by Other Research Sample Populations

	This Study	Urban [a]	Rural [b]	Internet [c]	Dependent [d]	Non-dependent [d]
Alcohol						
Ever used	99.6 %	99.5 %	98 %	96.5 %		
Use less than weekly	40.4 %	-	-	47.2 %		
Use weekly	43.9 %	-	-	36.0 %		
Tobacco						
Ever used	95.2 %	94 %	88 %			
Use regularly	35.2 %	84 %	67 %			
Ecstasy						
Ever used	39.9 %		56 %		-	-
Use in past 12 months	16.3 %		-		18.1 %	10.0 %
Amphetamines						
Ever used	41.4 %	90 %	75 %	42.4 %	-	-
Use in past 12 months	22.9 %	-	-	36.8 %	18.5 %	7.6 %
Use in past month	14.3 %	-	-	23.1 %	-	-
Cocaine						
Ever used	42.3 %	64 %	71 %	50.0 %	-	-
Use in past 12 months	23.9 %	-	-	30.4 %	33.2 %	17.3 %
Use in past month	13.1 %	-	-	24.8 %	-	-

Table 3.6 continued

	This Study	Urban [a]	Rural [b]	Internet [c]	Dependent [d]	Non-dependent [d]
Heroin						
Ever used	9.3 %	52 %	42 %		-	-
Use in past 12 months	3.4 %	-	-		1.0 %	0.9 %
Acid						
Use in past 12 months	26.2 %				15.5 %	9.5 %
Inhalants						
Ever used	31.7 %	51 %	23 %		-	-
Use in past 12 months	15.7 %	-			11.0 %	4.1 %

[a] Swift, Hall, and Copeland (1998)
[b] Reilly et al. (1998)
[c] Nicholson et al. (1999)
[d] Looby and Earleywine (2007)

similar to levels reported in the Internet (42%). Substantial differences are also evident in relation to the percent of participants who have used cocaine and heroin and the equivalent data for the urban, rural and Internet samples.

With regards to past year and past month use, the Internet sample used both amphetamines and cocaine at higher levels than the participants. The participants' past year use of ecstasy, amphetamines, and inhalants was most similar to that reported by Looby and Earleywine's (2007) dependent daily cannabis users. However, these two groups differed substantially with regards to past year use of cocaine (dependent sample higher) and acid (participants higher). Nevertheless, it is clear that the participants in the present study were more similar to Looby and Earleywine's dependant than non-dependant group in terms of past year substance use.

To summarise, the participants in the present study were more likely to have used illicit substances than the general population in Australia, the USA and the UK, but they were not overly adventurous or frequent users when compared to other substance using sample populations.

Sensation Seeking

Sensation seeking is rarely investigated in adult samples (Clayton, Segress, & Caudill, 2007), being assessed more commonly in adolescent populations. Thus, while the BSS-4 and SS2 have been employed with adolescent samples, no age-equivalent comparison data could be found for the present sample. Hence, the participants' data is compared to data from adolescent populations, below. In the latter studies, final BSSS-4 and SS2 scores were calculated by averaging the responses to all items (scoring range: 1-5). Using this scoring rationale, the participants' mean BSSS-4 score was 3.33 (SD = 0.87), while the mean SS2 score was 2.33 (SD = 0.94).

Stephenson et al. (2003) assessed sensation seeking in 5,187 7th-11th graders (median age: 14 years; 52% female) with the BSSS-4 and SS2. The mean BSSS-4 score for this sample population was 3.13 (*SD* = 0.88) and the mean SS2 score was 2.45 (*SD* = 1.06). For both measures, males scored higher than females, and older adolescents scored higher than younger adolescents. However, the gender and age effects were small (η^2 ranged from .01-.02). Age and gender effects were also reported by Vallone, Allen, Clayton and Xiao (2007), who employed the BSSS-4 to assess sensation seeking in 24,322 adolescents (12-17 year olds, 50% female). The mean BSSS-4 score for this sample was 3.05 (95% CI: 3.02-3.07).

While the gender effects reported by both Stephenson et al. and Vallone et al. reflect those evident in the present study, the participants in the present study show decreasing sensation seeking scores with increasing age, which is a converse age effect to that found in both of the adolescent populations. Vallone et al. (2007) noted that sensation seeking seemed to peak at 15 years of age in females (*M* = 3.14; 95% CI: 2.06-3.22) and at 17 years for males (*M* = 3.34; 95% CI: 3.26-3.40). As the present study does not include participants aged less than 18 years old, and consists primarily of substance users (in comparison to Vallone et al.'s general population sample), this premise cannot be either supported or rejected by the available data. However, it is worth noting the highest scoring group in Vallone et al.'s study were established tobacco smokers (*M* = 3.65; 95% CI: 3.53, 3.77) who reported lower levels of sensation seeking than the 18 year olds males in the present study (*M* = 3.71, *SD* = 0.77). It is likely that, as suggested by Clayton et al. (2007), sensation seeking has a developmental aspect, which potentially increases throughout adolescence, to peak in the late teens, before decreasing again during adulthood. If this is the case, sensation seeking would be likely to have stronger levels of association with the initiation of substance use, and have less predictive power with regards to continued substance use (Clayton et al., 2007). This premise will be explored further in Chapter 5.

To summarise, the participants in the present study recorded higher BSSS-4 scores than Stephenson et al.'s (2003) and Vallone et al.'s (2007) adolescent participants. But, interestingly, the participants in Stephenson et al.'s study scored higher on the SS2 than the participants in the current study.

Health and Sleep Problems

Few studies were identified as providing comparable data on health and sleep problems, with studies on medicinal cannabis the most likely to ask about these problems. For example, Ware, Adams, and Guy (2005), who evaluated medicinal cannabis use in the UK (*N* = 2969; mean age = 52.7 years [*SD* = 12.7]; 60.7% female), found that a third of their participants (32%) reported ever using cannabis for medicinal purposes. Chronic pain (25%) and multiple sclerosis (22%) were the conditions most commonly reported by participants using cannabis medicinally.

An Australian survey of medicinal cannabis users (*N* = 128, median age = 45 years, range: 24-88 years; 63% male) found that 53% of their participants experienced chronic pain, while 38% had arthritis, and 22% got migraines (Swift, Gates, & Dillon, 2005). While a Canadian study of 50 medicinal cannabis users (*M* = 38 years, range: 26-57 years; 66% male) found that the most common reasons for medicinal cannabis use were HIV/AIDS-related symptoms (22%) and chronic pain (14%). However, participants were most likely to report that problems sleeping (56%), loss of appetite (42%), and nausea or pain (28%) were relieved by cannabis use (Ogborne, Smart, Weber, & Birchmore-Timney, 2000).

Relevant data from the studies discussed here is presented in Table 3.7, where it is apparent that the participants in the present study reported similar levels of health problems to other studies.

Table 3.7

Comparison of Health and Sleep Problems reported by Participants and Other Research Sample Populations

	This Study	**Australian Sample [a]**	**Canadian Sample [b]**	**UK Sample [c]**
Chronic pain	17 %	53 %	14 %	11 %
Chronic fatigue	13 %	13 %	-	1 %
Sleep problems	46 %	-	56 %*	1 %
Eating disorder	6 %	-	4 %	-
Cancer	1 %	6 %	-	1 %

[a] Swift et al. (2005)
[b] Ogborne, Smart, Weber et al.(2000)
[c] Ware et al. (2005)
* Percent of participants reporting relief of these symptoms

Conclusions

These findings suggest that the participants in the present study differ from the general population in relation to a number of the previously reported risk factors for cannabis use. For example, it is clear than the present sample were more likely to smoke tobacco (e.g., Rey et al., 2002), use other illicit drugs (e.g., Fergusson et al., 2002), and have high levels sensation-seeking personality traits (e.g., Palmgreen et al., 2001) than general population samples. It was also typical of the participants to be currently single and unemployed (e.g., Teesson et al., 2000). However, in contrast to prior findings, participants did not tend to use alcohol at hazardous levels (e.g., McGee et al., 2000), and did not tend to have low levels of education (e.g., Fergusson et al., 2003). The association between these demographic and current lifestyle factors and cannabis use will be investigated in Chapter 6.

It is clear that the participants recruited to the present study are generally similar in demographic and lifestyle factors to individuals recruited to other cannabis use-related research studies; thus suggesting that the present study has been successful in tapping into the hidden population of non-treatment-seeking cannabis users. Additionally, the diversity

evident in the demographic profile suggests that the participants are from a broad cross-section of the general population. However they differed from general population samples on a number of factors previous reported as potential risk associated with cannabis use. The nature of the associations between these factors and cannabis use will be explored in Chapter 7, but first the childhood lifestyles of the participants are explored in the next chapter.

Demographic and Current Lifestyle Variables

A large number of variables were described in this Chapter. Those that are utilised in future chapter are displayed in Table 3.8, while the descriptive statistics for the variables are provided in Appendix D40.

Table 3.8

Demographic and Current Lifestyle Variables

	Scoring Range	Score Interpretation
Demographic & Environmental Factors		
Gender	1 – 2	1 = 'female'; 2 = 'male'
Age group	1 – 5	Higher score = older age Where:1 = 'Teenagers' (18-19 years); 2 = 'Early twenties' (20-23 years); 3 = 'Mid-late twenties' (24-29 years); 4 = 'Thirties' (30-40 years); 5 = 'Forties and over' (>40 years)
Highest level of education	1 – 5	Higher score = more education Where: 1 = 'less than high school'; 2 = 'high school'; 3 = 'post-school qualifications'; 4 = 'undergraduate degree'; 5 = 'postgraduate qualifications'
Proxy SES (self)	1 – 5	Higher scores = higher socioeconomic status Where: 1 = 'low'; 2 = 'moderately low'; 3 = 'moderate'; 4 = 'moderately high'; 5 = 'high'
Unemployed	0 – 1	0 = 'no'; 1 = 'yes'
Single marital status	0 – 1	0 = 'no'; 1 = 'yes'
Region of residence	1 – 3	Higher score = more remote Where: 1 = 'urban'; 2 = 'suburban/country town'; 3 = 'rural/remote'

Table 3.8 continued

	Scoring Range	Score Interpretation
Individual Factors		
Alcohol use	1 – 6	Higher scores = more frequent use in the past 12 months Where: 1 = 'no use'; 2 = 'less than monthly use'; 3 = 'monthly use'; 4 = 'weekly use'; 5 = 'use on most days'; 6 = 'daily use'
Tobacco use	1 – 6	Higher scores = more frequent use in the past 12 months Where: 1 = 'no use'; 2 = 'less than monthly use'; 3 = 'monthly use'; 4 = 'weekly use'; 5 = 'use on most days'; 6 = 'daily use'
Poly-substance use (α = .79)	0 – 4	Higher scores = more illicit substances used in past month Where: 0 = 'no substances'; 1 = '1-2 substances'; 2 = '3-4 substances'; 3 = '5-8 substances'; 4 = '9 or more substances'
Sensation seeking (α = .86)	0 – 30	Higher scores = higher sensation seeking trait
Health problems (α = .65)	0 – 4	Higher scores = higher levels of health problems Where: 0 = 'no health problems'; 1 = 'very low level'; 2 = 'low level'; 3 = 'moderate level'; 4 = 'high level' of health problems
Sleep problems	0 – 3	Higher scores = more sleep problems Where: 0 = 'no sleep problems'; 1 = 'sometimes affected'; 2 = 'often affected'; 3 = 'always affected'

CHAPTER 4

THE PARTICIPANTS II: CHILDHOOD LIFESTYLE

Introduction

The first objective of the present study is to describe the hidden population of cannabis users. In addressing this objective, the demographic profile and current lifestyles of the 989 participants were described in the previous chapter. The present chapter continues this investigation by focusing on the participants' childhood lifestyles, specifically environmental and individual factors experienced before they were 16 years of age. The information covered in this chapter will provide a developmental context for the participants' cannabis use. A large degree of heterogeneity was evident in relation to the participants' current lifestyle, thus it is hypothesised that the participants also experienced diverse childhood lifestyles.

The examination of childhood factors is considered a particularly important aspect in the overall aim of understanding the sample population due to the often reported links between cannabis use and childhood issues. To summarise the literature, cannabis users in comparison to nonusers are more likely to have a history of conduct disorder (e.g., Rey, Sawyer, Raphael, Patton, & Lynskey, 2002), depression (e.g., Lynskey et al., 2002) and social anxiety (e.g., Lynskey et al., 2002). They are more likely to report low levels of parental attachment during adolescence (e.g., McGee, Williams, Poulton, & Moffitt, 2000), and have a family history of cannabis or other substance use (e.g., Hopfer, Stallings, Hewitt, & Crowley, 2003). Cannabis users are also more likely to have been exposed to parental conflict (e.g., Lynskey et al., 2002), and socio-economic disadvantage during childhood (e.g., McGee et al., 2000), being more likely to have grown up in a single-parent family (e.g., Rey et al., 2002) with a lower than average income (e.g., Gruber, Pope, Hudson, & Yurgelun-Todd, 2003).

Individuals at high risk of developing cannabis dependence have also been found to be more likely to have a history of sexual abuse than non-dependent users and non-users (e.g., Lynskey et al., 2002).

Thus, if the childhood factors that have been linked to cannabis use in the literature are in fact risk factors for subsequent use, we would expect the participants in the present study to fall between the general population samples (lower) and the treatment-seeking sample (higher) with regards to the percent of participants affected. This premise is investigated below. It is also probable that participants more severely affected by such risk factors would have been more likely to have initiated cannabis at an earlier age than unaffected or less affected participants. This issue will be investigated in Chapter 5.

The first section of this chapter provides an exploration of the participants' childhood environments, while the second section covers individual factors. As the focus of this chapter is on issues experienced by the participants up until they were 16 years of age, differences based on the participants' current age have not been investigated. Thus, only gender effects are examined in the following analyses. The final section of the chapter provides a summary of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample population in context, both in relation to cannabis-using populations and the general population.

Environmental Factors

Nineteen questionnaire items related to the participants' childhood environment. These items tapped family structure, socioeconomic status, family dynamics, parental problems and, traumatic events. Composite variables were developed from these items, as described below.

Family Type

Family Structure

The majority of participants (65%) had lived with both of their natural parents throughout their childhood (up to 16 years of age), while 2% of participants were raised from birth by adoptive parents. The usual reason for family units not remaining intact during childhood was parental separation or divorce (26%), however, for 5% of participants, one of their parents had died. Very low numbers of participants lived in other situations, such as foster care (2%) or institutionalized care settings (1%). Thus, most participants had a fairly stable home environment with regards to the individuals providing care, with 67% having their two original carers throughout childhood. A further 30% were cared for by one of their original carers, while 3% of participants had a more unstable care environment during their childhood, without either of their original carers (see Appendix E1).

Overall, 22% of participants were raised in a sole parent family. While females (24%) were slightly more likely than males (21%) to have grown up in this type of household, a one-way ANOVA (where: 0 = 'two parent family'; 1 = 'sole parent family') found no evidence of gender differences: $F(1, 988) = 0.86$, $p = .355$, $\eta^2 = .001$ (see Appendices E2 & E3).

Parental Job Category

Two questionnaire items related to the occupation held by the participants' parents (or guardians) while the participants were growing up. There were 34 response options available to participants. The most common occupation reported for mothers was home duties (20%), while 10% were teachers; this was followed by professional work (9%), administration (8%), and health (8%). In contrast, 19% of the participants' fathers were professionals, and 10% were some other sort of skilled worker, followed by working in a

trade (9%), middle management (6%), and as a supervisor/team leader (5%) (see Appendix E4).

These questionnaire items were used to develop a proxy socioeconomic status (SES) variable. First, the job categories were grouped into 5 SES bands, where 1 = 'highest SES' (e.g. professionals) and 5 = 'lowest SES' (e.g. unskilled labour), using the guidelines employed by the NSW Department of Education. For each participant, the SES score for their father was added to that for their mother, thus providing a score out of 10, where higher scores indicated a lower SES. The mean participant score for this proxy SES variable was 5.78 (SD = 2.13). A one-way ANOVA indicated that there were no gender differences for this variable: $F(1, 988) = 1.65$, $p = .200$, $\eta^2 = .002$ (see Appendices E2 & E3).

Family Dysfunction

Family Dynamics

Four questionnaire items were designed to gain insight into the dynamics of the family environments in which participants lived during childhood, specifically the level of conflict to which they were exposed. The first two items related to how well participants got along with their parents and siblings (if they had any). In general, participants reported a good relationship with their parents: 26% said they got along very well, 34% reported getting along quite well, while 26% got along moderately well with their parents, with 11% stating that they got along with their parents a little bit, and 3% reporting not getting along at all. Similarly, participants tended to have good relationships with their siblings: 34% got along very well, 28% quite well, 26% got along moderately well, while 9% reported only getting a long a little bit with their siblings, and 3% did not get a long at all (see Appendix E5).

The third item assessing family dynamics asked how often their parents (or guardians) argued and the fourth item assessed overall levels of conflict in the home. Most participants reported that their parents argued a little (41%) or a moderate amount (23%).

Sixteen percent of participants stated that their parents did not argue, while 11% reported that their parents argued quite a lot. Very few participants (8%) said they were exposed to a lot of parental arguments. Similarly, most participants reported a little (38%) or moderate (25%) amounts of conflict in the home. A total of 15% stated that there was no conflict, with fewer participants reporting quite a lot (13%) or a lot (9%) of conflict in their childhood home (see Appendix E5).

These four items were used to create a new variable: family dynamics (scoring range: 0-16, higher scores indicating poorer dynamics). This variable was found to have good internal consistency reliability: $\alpha = .71$, $N = 989$. The mean family dynamics score for the participants was 5.66 ($SD = 3.25$), while a one-way ANOVA indicated that there were no gender differences: $F(1, 973) = 1.96$, $p = .667$, $\eta^2 < .001$ (see Appendices E2 & E3).

Domestic Violence

A single item asked participants about domestic violence in the family home, specifically: "How often did the conflict involve physical violence?" Participants who had reported no conflict in their family home ($N = 152$), and were therefore not asked the domestic violence question, were assigned a score of 0 ('never') for this variable. Overall, 55% of participants reported that physical violence was never a feature of family conflict. For 22% of participants physical violence hardly ever happened, while it sometimes occurred in 16% of family conflicts. However, only small proportions of the participants were exposed to conflicts which escalated to domestic violence fairly often (5%) or always (2%) (see Appendix E5).

This single item was retained as a variable assessing exposure to domestic violence during childhood (scoring range: 0-4, higher scores indicating greater exposure). The mean domestic violence score for the participants was 0.76 ($SD = 1.01$). A one-way ANOVA

indicated that there was no significant gender effect: $F(1, 988) = 0.01$, $p = .908$, $\eta^2 < .001$ (see Appendices E2 & E3).

Family Addiction Problems

Five questionnaire items asked participants about problems in their family, such as substance use and gambling addiction. Thirty-six percent of participants reported a parent experiencing alcohol addiction, while only 8% had a parent with a gambling problem. The three items tapping illicit substance use by a family member covered the consumption of cannabis, ecstasy, and other illicit substances, with 35%, 7%, and 18% of participants, respectively, reporting such family use (see Appendix E6).

A variable assessing family problems, consisting of the five questionnaire items (scoring range: 0-5, higher scores indicating more problems), was found to have adequate internal consistency reliability: $\alpha = .62$, $N = 989$. The mean family problems score was 1.04 ($SD = 1.20$) and no gender differences were identified through application of a one-way ANOVA: $F(1, 986) = 0.72$, $p = .396$, $\eta^2 < .001$ (see Appendices E2 & E3).

Traumatic Events

Abuse

Participants were asked if they experienced physical and/or sexual abuse before the age of 16 years. They were also provided with a response option where they could report their decision not to answer the items covering childhood abuse. A total of 32 (3%) participants chose not to answer the items related to physical abuse, while 39 (4%) participants declined to answer the sexual abuse-related items. Approximately a quarter of participants (24%) reported experiencing physical abuse, while a smaller proportion of participants (15%) reported childhood sexual abuse (see Appendix E6).

Two one-way ANOVAs were completed to determine if there were any gender differences evident for either of the childhood abuse variables (scoring: 0 = 'no abuse', 1 = 'abuse'). The ANOVA investigating physical abuse indicated a lack of gender difference: $F(1, 956) = 0.17$, $p = .896$, $\eta^2 < .001$. However, there was medium-sized, significant, gender effect evident for sexual abuse, with females ($M = 0.28$, $SD = 0.45$) being more likely to report such abuse than males ($M = 0.07$, $SD = 0.26$): $F(1, 949) = 84.87$, $p < .001$, $\eta^2 = .082$ (see Figure 4.1 and Appendices E2 & E3).

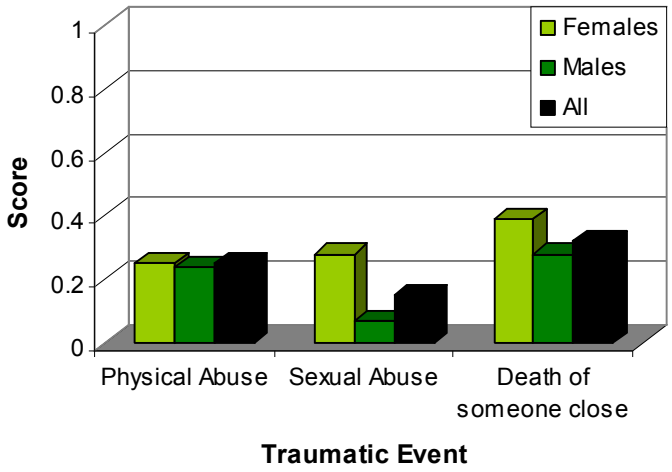

Figure 4.1: Traumatic events occurring during childhood, by gender

Death of Someone Close

To gain an indication of childhood trauma, participants were also asked if someone close to them (e.g. family member, friend) had died during their childhood. A total of 32% of participants reported that someone close to them had died (see Appendix E6). A one-way ANOVA was completed to determine if there was a gender differences evident for this variable (scoring: 0 = 'no death', 1 = 'someone close died'). The ANOVA indicated a small, but significant, gender effect, with females ($M = 0.39$, $SD = 0.49$) being more likely to report

the death of someone close during childhood than males (M = 0.28, SD = 0.45): $F(1, 988)$ = 12.66, $p < .001$, $\eta^2 = .013$ (see Figure 4.1 and Appendices E2 & E3).

Lack of Adult Support

Participants were asked if there was an adult they could go to for support or help whenever they needed it. Approximately half of the participants felt that there was always (37%) or mostly (22%) someone who was available to them in these situations. A total of 19% of participants felt this was sometimes the case, while 11% said that they hardly ever had an adult they could seek such support from. A further 12% reported never having an adult that they felt they could ask for help or support when they need it (see Appendix E6).

The participants' mean score for this item (scoring range: 0-4, higher scores indicating less support) was 1.39 (SD = 1.38), and there were no gender differences evident: $F(1, 988) = 6.01$, $p = .014$, $\eta^2 = .006$ (see Appendices E2 & E3).

Individual Factors

Childhood individual factors assessed by the questionnaire were primarily focused on externalizing behaviours (e.g., conduct issues or delinquent behaviours) and internalizing disorders (e.g., psychopathology). Composite variables were developed from these items, as described below.

Externalising Behaviours

Nineteen items from the questionnaire collected data on childhood externalising behaviours. The first four variables related to the use of alcohol, tobacco, cannabis or other illicit substances before the age of 16. The remaining 15 items covered escalating behavioural problems from lying to parents about activities to truancy, running away from home, and involvement with the law.

Early Substance Use

Early substance use was common in the present sample, with most participants (67%) having tried tobacco before they were 16 years old. Forty-seven percent of participants had used alcohol by this age, whereas 40% had tried cannabis, and 12 % had consumed another illicit substance (see Appendix E7). Four one-way ANOVAs were conducted on the data to determine if any gender effects were evident for early substance use (0 = 'no use', 1 = 'use'). No gender differences were indicated for early use of tobacco, alcohol, cannabis, or other illicit substances (see Appendix E8 & E9).

Delinquent Behaviour

Each of the 15 questionnaire items describing delinquent behaviours were scored on a 4-point scale, with which participants reported how often they had engaged in the behaviours, where: 0 = 'never', 1 = 'once or twice', 2 = 'a few times', 3 = 'many times'. Many participants reported school related issues such as truancy (72 %) and suspension (90%), but few reported lying to their parents about what they were doing or who they were with (14%) or stealing anything from a store (8%). One third of participants had run away from home (33%), 43% had been a gang member, and 24% had contact with the judiciary (see Table 4.1).

These questionnaire items were used to create a new variable assessing delinquent behaviour, which was found to have good internal consistency ($\alpha = .87$, $N = 989$). The variable had a scoring range of 0-45, while the mean delinquent behaviour score for participants was 8.12 ($SD = 6.37$). Males ($M = 8.52$, $SD = 6.36$) scored slightly higher than females ($M = 7.47$, $SD = 6.43$), but a one-way ANOVA indicated that this difference was not significant: $F(1, 988) = 6.33$, $p = .012$, $\eta^2 = .006$ (see Appendices E8 & E9).

Table 4.1

Percentage of Participants Reporting Externalising Behaviours

	Never		**Once or Twice**		**A Few Times**		**Many Times**	
	N	%	*N*	%	*N*	%	*N*	%
Lie to parents about activities	850	85.9 %	84	8.5 %	30	3.0 %	25	2.5 %
Truant from school	280	28.3 %	255	25.8 %	226	22.9 %	228	23.1 %
Suspended from school	103	10.4 %	221	22.3 %	324	32.8 %	340	34.4 %
Expelled from school	324	32.8 %	399	40.3 %	167	16.9 %	99	10.0 %
Ran away – 1 night	666	67.3 %	209	21.1 %	78	7.9 %	36	3.6 %
Ran away – many days	721	72.9 %	165	16.7 %	69	7.0 %	34	3.4 %
Ran away – week or longer	576	58.2 %	267	27.0 %	102	10.3 %	44	4.4 %
Vandalise property	907	91.7 %	48	4.9 %	18	1.8 %	16	1.6 %
Steal from shop	907	91.7 %	56	5.7 %	12	1.2 %	14	1.4 %
Gang member	568	57.4 %	303	30.6 %	85	8.6 %	33	3.3 %
Steal a car	887	89.7 %	51	5.2 %	27	2.7 %	24	2.4 %
Trouble with police	814	82.3 %	132	13.3 %	29	2.9 %	14	1.4 %
Arrested/charged for a crime	747	75.5 %	172	17.4 %	46	4.7 %	24	2.4 %
Convicted of a crime	838	87.4 %	103	10.4 %	32	3.2 %	16	1.6 %
Incarcerated	812	82.1 %	133	13.4 %	32	3.2 %	12	1.2 %

Running away from home, while seen as an aspect of delinquent behaviour, is also an indicator of family functioning. For example, Rees and Lee (2005) reported that most of the reasons provided by adolescents for running away were related to problems within the home environment, including poor relationships with family members, conflict within the home, general unhappiness, and maltreatment (i.e., neglect, physical abuse, emotional abuse, sexual abuse). Therefore, a variable was constructed to cover duration of running away from home. The three relevant questionnaire items were weighted for severity, with a weight of one for running away overnight, two for running away for several days, and a weight of 3 for running away for a week or more.

This new variable was found to have good internal consistency reliability ($\alpha = .92$), but it was deemed necessary to convert the variable from a continuous (scoring range: 0-18) to a categorical variable to improve normality statistics (see Appendix E10). Thus, the following scale was employed: 0 = 'did not run away'; 1 = 'low level running away'; 2 = 'moderate level running away; 3 = 'high level running away'. The new variable was found to correlate significantly with exposure to domestic violence during childhood ($r = 0.32$, $p < 0.001$; $N = 984$), and being physically abused ($r = 0.25$, $p < 0.001$; $N = 953$) or sexually abused ($r = 0.24$, $p < 0.001$; $N = 947$). The participants' mean score for this running away from home variable was 0.45 ($SD = 0.80$) and no gender differences were indicated by a one-way ANOVA: $F(1, 988) = 2.41$, $p = .121$, $\eta^2 = .002$ (see Appendices E8 & E9).

Psychological Issues

Psychopathology

Participants were asked if they had ever experienced a number of psychological disorders, and, if so, what age they were when symptoms were first experienced. This data was used to identify participants who had experienced depression (31%), anxiety (24%), and sleep problems (26%) during childhood (see Appendix E10). These items were used to form

a new childhood psychopathology variable (scoring range: 0-3), which was found to have adequate internal consistency: $\alpha = .62$, $N = 981$. A one-way ANOVA indicated that females ($M = 0.99$, $SD = 1.11$) experienced significantly more psychopathology in childhood than males ($M = 0.71$, $SD = 0.92$), however, the gender effect was small: $F(1, 980) = 17.94$, $p < .001$, $\eta^2 = .018$ (see Figure 4.2 and Appendices E8 & E9).

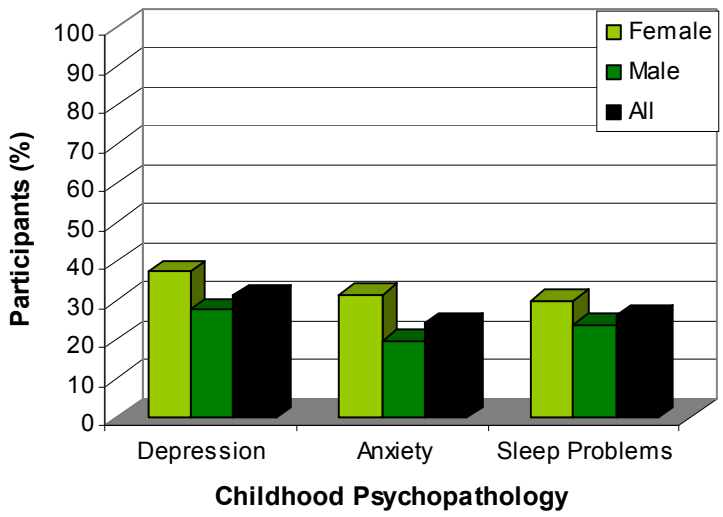

Figure 4.2: Childhood psychopathology by gender

ADD/ADHD

A single questionnaire item assessed whether participants had ever received a diagnosis of ADD/ADHD (0 = 'no', 1 = 'yes'). This item was endorsed by 16% of participants (see Appendix E10). A one-way ANOVA indicated that there were no gender differences between males and females with regards to ADD/ADHD: $F(1, 978) = 0.73$, $p = .394$, $\eta^2 = .001$ (see Appendices E8 & E9).

Summary & Discussion

Chapter Summary

The first objective of the present study was to describe the hidden population of cannabis users within the general population, with the current chapter focusing on the childhood lifestyles of the study participants.

Most participants lived with their two natural parents throughout childhood and they got along well with their parents and siblings. There were low-moderate levels of conflict in the family home and physical violence was not a usual feature of such conflict. Most did not have parents with substance use or gambling problems or a gambling addiction, most were not abused, and few lost someone close to them while they were growing up. Additionally, most had an adult they could turn to for help or support if they needed it. Further, while many had used tobacco before they turned 16, most had not used alcohol or any illicit substances by this age. Behaviourally, they may have gotten into a bit of trouble at school, or been truant, but they rarely ran away from home, joined a gang, or had brushes with the law. During childhood, participants were also not typically anxious or depressed, or diagnosed with ADD/ADHD, and most had no trouble sleeping.

However, some participants did experience a turbulent childhood. For example, 33% of participants experienced a change in primary carer during childhood, 45% were exposed to domestic violence, 35% had a parent with an addiction problem, 24% were physically abused, 15% were sexually abused, and 41% did not have an adult they could rely on to provide them with help or support when it was needed. Further, 40% had used cannabis before they were 16 years old, 12 % had used another illicit substance at that age, 42% had run away from home for a week or longer, 42 % had joined a gang, 10% had stolen a car, 18% had been incarcerated, and 31% were depressed. These findings suggest a large amount

of heterogeneity in the childhood lifestyles and experiences of the participants in the present study.

Comparison Data

Environmental Factors

Comparison data discussed in this section was drawn from adolescent samples because adult studies do not tend to assess living situations and associated factors from childhood. However, it was not possible to locate equivalent comparison data for a number of the childhood factors assessed in the present study. Thus, Table 4.2 provides a comparison of the participants' childhood environment with three general population samples of adolescents from Germany (Hofler et al., 1999), Australia (Rey et al., 2002), and Austria (Rumpold et al., 2006), and a sample of adolescents from the USA who were receiving treatment in relation to their substance use (Tims et al., 2002).

Study participants were more likely than the Australian and Austrian samples to have been raised in a single-parent home, but were less likely to have this family structure than the treatment sample. Further, study participants were more likely than the German sample, but less likely than the treatment sample to have experienced childhood trauma. However, in contrast to expectations, participants were less likely to have been exposed to parental illicit substance use than the German sample, and more likely than the treatment sample to have parents with alcohol and substance use problems (see Table 4.2).

As noted above, 45% of participants in the present study reported at least some exposure to domestic violence during childhood, while 7% stated that conflict within the family often or always escalated to physical violence. These figures are higher than those reported by Cawson (2002), who surveyed a random probability sample of young people (18-24 years, N = 2869) from the UK about their childhood family environment. Only 26% of this sample reported domestic violence in the home, with 5% stating that this violence was

Table 4.2

Comparison of the Childhood Environment Experienced by the Participants and Other Research Sample Populations

	This Study	**Treatment Sample** [a]	**German Sample** [b]	**Australian Sample** [c]	**Austrian Sample** [d]
	N = 989	*N* = 600	N = 1228	*N* = 1490	*N* = 485
Age range		12 – 18 years	14 – 17 years	13 – 17 years	14 – 19 years
% Male	62 %	83 %	52 %	48 %	41 %
Family structure					
Original parents	65 %	-	-	74 %	70 %
Single parent family	23 %	50 %	-	10 %	19 %
Parental substance use problems					
Alcohol	36 %	23 %	-	-	-
Illicit substances	35 %	11 %	49 %	-	-
Childhood trauma	38 %	57 %	12 %	-	-

[a] Tims et al. (2002)
[b] Hofler et al. (1999)
[c] Rey et al. (2002)
[d] Rumpold et al. (2006)

frequent. Australian normative data is similar to that from the UK, with 23% of a stratified random sample of 12-20 years olds (*N* = 5,000) reporting exposure to domestic violence in the family home (Indermaur, 2001). Study participants were also less likely to have experienced physical and sexual abuse than a Canadian treatment-seeking sample of adolescent substance users (aged 14-24 years, 71% male) (Ballon, Courbasson, & Smith, 2001). However, as can be seen in Table 4.3, study participants were more likely to have experienced abuse during childhood than would be expected with reference to general population norms in the USA (Federal Interagency Forum on Child and Family Statistics, 2007) and the UK (Cawson, Wattam, Brooker, & Kelly, 2000).

Table 4.3

Comparison of Childhood Abuse Experienced by the Participants and Other Sample Populations

	This Study	**Canadian Sample** [a]	**USA Population**	**UK Population**
	N = 989	*N* = 287	**Incidence Rate** [b]	**Incidence Rate** [c]
Physical abuse	24 %	35 %	17 %	21 %
Sexual abuse	15 %	22 %	9 %	11 %

[a] Ballon et al. (2001)
[b] Federal Interagency Forum on Child and Family Statistics(2007)
[c] Cawson et al. (2000)

There was no gender difference for physical abuse in this study; with a similar proportion of females (25%) reporting physical abuse as males (24%). This contrasts with the Canadian sample, which reported that more than half of the females (58%) experienced physical abuse in comparison to just 26% of the males (Ballon et al., 2001). With regard to childhood sexual abuse, a gender difference was evident in the present study as well as the Canadian study; however a greater gender difference was apparent in the latter study. That is, in the present study, females (28%) were four times more likely to be affected than males

(7%), whereas females in the Canadian sample were five times more likely to have been affected by sexual abuse than males (i.e., 50% vs. 10%) (Ballon et al., 2001).

Thus, overall, it appears that a higher proportion of the study sample was exposed to potentially detrimental conditions during childhood than is typically experienced in the general population. However, the rates for these childhood risk factors were lower in the study sample than in samples consisting of treatment-seeking adolescent substance users.

Individual Factors

Adolescent participants were again used as comparison samples, with four of the six comparison groups employed in this section introduced in the previous section; these are the samples from Germany (Hofler et al., 1999), Australia (Rey et al., 2002) and Austria (Rumpold et al., 2006), and the treatment sample from the USA (Tims et al., 2002). Two other groups, both from the USA, a sample from the Minnesota Twin Family Study (King, Iacono, & McGue, 2004) and a sample from the twin, adoption, and family study component of the University of Colorado's Centre for Antisocial Drug Dependence study (Young et al., 2002), were also compared to participant data (see Table 4.4).

Early cannabis use and ADD/ADHD diagnosis values were higher in the study participants than in population samples, but lower than for treatment-seekers (see Table 4.4). Similarly, for all other childhood individual factors, higher proportions of the study participants engaged in behaviours or were affected by conditions than were reported for other research samples. For example, participants in the present study were much more likely to have experienced psychopathology in childhood than the general population samples.

Although a number of studies assessed delinquent behaviour or conduct disorder, they typically reported this information in terms of mean scores. Thus, only one relevant study was located for comparison with the participants. The study, by Pedersen, Mastekaas, and Wichstrom (2001), assessed conduct problems in a stratified random sample of

Table 4.4

Comparison of Childhood Individual Factors Reported by the Participants and Other Research Sample Populations

	This Study	**Treatment Sample** [a]	**German Sample** [b]	**Australian Sample** [c]	**Austrian Sample** [d]	**USA Twin Sample** [e]	**USA Sample** [f]
	N = 989	*N* = 600	N = 1228	*N* = 1490	*N* = 485	*N* = 1364	*N* = 3072
Age range		12 – 18 years	14 – 17 years	13 – 17 years	14 – 19 years	11 – 14 years	12 – 18 years
% Male	62 %	83 %	52 %	48 %	41 %	49 %	46 %
Early substance use							
Alcohol	47 %	-	-	-	32 %	30 %	45 %
Tobacco	67 %	-	-	-	35 %	32 %	23 %
Cannabis	40 %	85 %	32 %	18 %	5 %	10 %	10 %
Other illicit drug	12 %	-	4 %	-	1 %	-	9 %
ADD/ADHD	16 %	38 %	-	6 %	-	7 %	-
Any psychopathology	38 %	-	-	-	14 %	-	-
Depression	31 %	-	11 %	9 %	-	3 %	-
Anxiety	24 %	-	11 %	-	-	6 %*	-

[a] Tims et al. (2002)
[b] Hofler et al. (1999)
[c] Rey et al. (2002)
[d] Rumpold et al. (2006)
[e] King et al. (King et al., 2004)
[f] Young et al. (2002)
* only female participants were assessed for anxiety

Norwegian adolescents. As can be seen in Table 4.5, participants in the present study were far more likely, than the Norwegian participants, to have been truant from school. Similarly, higher proportions of participants in the present study had stolen a car, but the Norwegian sample contained a higher percentage of participants who had committed at least one act of petty theft. A total of 8% of the Norwegian sample had run away from home overnight. This was substantially lower that the proportion of the present sample that had run away, but was not that dissimilar to the UK population incidence level reported for 14-16 year olds.

Table 4.5

Comparison of Delinquent Behaviours Reported by the Participants and Other Research Sample Populations

	This Study	**Norwegian Sample** [a]	**UK Sample** [b]
	N = 989	*N* = 2436	*N* = 10,716
Age range		12 – 16 years	14-16 years
% Male	62 %	50 %	52 %
Delinquent behaviours			
Truant from school	72 %	23 %	-
Theft	8 %	11 %	-
Steal car	10 %	1 %	-
Run away overnight	33 %	8 %	11 %

[a] Pedersen et al.(2001)
[b] Rees and Lee (2005)

Thus, it is apparent that a higher proportion of the present sample engaged in early substance use and delinquent behaviours than that of the general population samples reviewed. The participants in the present study were also more likely to have experienced psychopathology, and there was a higher rate of ADD/ADHD diagnoses, than reported in general population studies. Conversely, treatment-seeking substance users were more likely to have been early cannabis users, and had a higher rate ADD/ADHD, than the present study's sample population.

Conclusions

These findings suggest that the participants in the present study differ from the general population in relation to a number of the previously reported risk factors for cannabis use. For example, it is clear that the present sample were more likely to have a history of depression, anxiety, sexual abuse (e.g., Lynskey et al., 2002), and conduct issues (e.g., Rey et al., 2002). The participants were also more likely to have grown up in a single-parent family (e.g., Rey et al., 2002), have been exposed to parental conflict (e.g., Lynskey et al., 2002) than general population levels would suggest. As such, the present findings do not support the reported lack of association between cannabis use and history of behavioural problems, or conflict in the family (e.g., McGee et al., 2000). Thus, compared to normative data, the proportion of participants in this sample who were exposed to potentially detrimental conditions during childhood tended to be high, but was lower than that reported in the studies of treatment-seeking substance users.

It is important to note that, by asking participants to reflect on an earlier time in their lives to report on the issues discussed in this chapter, it is possible that an element of recall bias has been at play. If the data has been affect in this way, it is most likely that the participants have under-reported their level of exposure to events, and participation in behaviours, that are viewed as being socially undesirable (Hassan, 2006).

Nevertheless, the large amount of diversity of childhood experiences and behaviours evident in the present sample suggest that there is likely no single type of early life experience that leads to cannabis use. However, the proportion of participants in this sample who were exposed to potentially detrimental conditions during childhood tended to be high in comparison to normative data from several countries, but was generally lower than that reported in the studies of treatment-seeking substance users. Further, individuals engaging in high levels of externalising behaviour and those affected by psychopathology appear to be

over-represented in the present sample when compared to incidence levels evident in general population studies. These findings tend to suggest that many of the childhood factors assessed in the present study may have been risk factors for subsequent cannabis use. This premise will be investigated in the next chapter.

Demographic and Current Lifestyle Variables

A large number of variables were described in this Chapter. Those that are utilised in future chapter are displayed in Table 4.6, while the descriptive statistics for these variables are provided in Appendix E12.

Table 4.6

Childhood Lifestyle Variables

	Scoring Range	Score Interpretation
Environmental Factors		
Sole parent family	0 – 1	0 = 'no'; 1 = 'yes'
Proxy SES (parental)	2 – 10	Higher scores = lower socioeconomic status
Family Dynamics (α = .71)	0 – 16	Higher score = poorer dynamics
Domestic Violence	0 – 4	Higher score = more education Where: 0 = 'never'; 1 = 'hardly ever'; 2 = 'sometimes'; 3 = 'fairly often'; 4 = 'always'
Family Problems (α = .62)	0 – 5	Higher score = more problems
Physical Abuse	0 – 1	0 = 'no abuse'; 1 = 'abused'
Sexual Abuse	0 – 1	0 = 'no abuse'; 1 = 'abused'
Death of Someone Close	0 – 1	0 = 'no death'; 1 = 'someone close died'
Lack of Support	0 – 4	Higher scores = less support Where: 0 = 'always had someone for support'; 1 = 'mostly'; 2 = 'sometimes'; 3 = 'hardly ever'; 4 = 'never had someone for support'
Individual Factors		
Early Tobacco Use	0 – 1	0 = 'no use'; 1 = 'use before 16 years old'
Early Alcohol Use	0 – 1	0 = 'no use'; 1 = 'use before 16 years old'

Table 4.6 continued

	Scoring Range	Score Interpretation
Early Cannabis Use	0 – 1	0 = 'no use'; 1 = 'use before 16 years old'
Early Substance Use	0 – 1	0 = 'no use'; 1 = 'use before 16 years old'
Delinquent Behaviour (α = .87)	0 – 45	Higher scores = more severe delinquent behaviour
Running Away from Home (α = .92)	0 - 3	Higher scores = more/longer incidences of running away Where: 0 = 'no running away'; 1 = 'low level running away'; 2 = 'moderate level running away'; 3 = 'high level running away'
Childhood Psychopathology (α = .62)	0 – 3	Higher scores = more psychopathology
ADD/ADHD	0 – 1	0 = 'no diagnosis'; 1 = 'diagnosed'

CHAPTER 5

INITIATION OF CANNABIS USE

Introduction

The second objective of the present study is to increase knowledge about, and understanding of, the nature of cannabis use. Thus, the present Chapter contains a detailed examination of the study participants' initiation to cannabis use, while current patterns of cannabis use are in investigated in Chapter 6. Heavy, prolonged, and dependent cannabis use in explored in Chapter 7, and motives and experiences of use are investigated in Chapter 8.

In Chapter 4, a large amount of diversity of childhood experiences and behaviours were evident in the present sample, suggesting that there is likely no single type of early life experience that leads to cannabis use. However, in comparison to the present sample, general population samples were found to have lower levels of a number of previously reported risk factors for cannabis use, while treatment samples were more affected than the present sample. These findings tend to suggest that the childhood factors assessed in the present study represent risk factors for subsequent cannabis use. It is, therefore, hypothesised that exposure to these factors will be predictive of early initiation of cannabis use. Further, it is believed that the information presented in the present chapter will demonstrate the presence of heterogeneity in participant experiences of using cannabis for the first time.

In the present chapter, the investigation initially focuses the participants' first use of cannabis, such as the circumstances and experiences of this cannabis use. The second section explores age at first use of cannabis and associated issues. The final section provides a summary of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample population in context, both in relation to cannabis-using populations and the general population.

Initiation of Cannabis Use

A total of 945 (96%) participants had tried cannabis at least once. This consisted of 345 (93%) of the female and 600 (97%) of the male participants. The following information describes these participants' first experience of using cannabis.

Expectancies and Outcomes

Approximately half of the females (48%) and two-thirds of males (64%) knew in advance that they were going to try cannabis on the occasion they did so for the first time. Curiosity was the most commonly reported feeling associated with first use of cannabis (79%), followed by feeling excited (50%). Feeling pressured to use was reported by very few participants (4%), with greater numbers feeling unsure or worried (13% and 22%, respectively) (see Appendix F1).

The experiences of first cannabis use reported by participants indicated that they were most likely to have felt 'high' (36%), followed by feeling 'stoned' (26%) (see Table 5.1 and Appendix F2). However, 25% of participants reported that the cannabis had no effect on them and, of these, 56% reported that the overall experience was not as good as they had expected. This is in contrast to the participants reporting getting 'high' or 'stoned' who were most likely to report the experience as being better than expected (see Table 5.1 and Appendix F2).

Table 5.1

Percentage of Participants Reporting Various Outcomes Resulting from their First Experience of Cannabis Use

	Subjective Experience of Use						
Outcome compared to expectations	Stoned	High	Out of it	No effect	Felt sick	Other effect	TOTAL
Better than expected	12.6 %	15.0 %	1.3 %	0.5 %	0.2 %	0.5 %	30.2 %
As expected	4.8 %	7.1 %	0.4 %	0.9 %	0.0 %	0.3 %	13.5 %
Not as good	1.7 %	2.2 %	1.4 %	14.3 %	2.6 %	0.6 %	22.8 %
Not better or worse, just different	5.0 %	9.3 %	1.7 %	6.6 %	0.4 %	1.5 %	24.5 %
Don't remember	2.1 %	2.2 %	0.4 %	3.1 %	0.2 %	0.9 %	9.0 %
TOTAL	26.2 %	35.9 %	5.2 %	25.4 %	3.4 %	3.8 %	100.0 %

Physical and Social Context

The vast majority of participants first tried cannabis with a friend or friends (85%) and the most common setting was at a friend's home (36%), with 34% of participants using cannabis for the first time with a friend in their friend's home. The second most common combination was use with a friend in a public place (e.g., a park or beach). Very few participants reported trying cannabis for the first time alone, and it was rare for people to first use cannabis in a pub or nightclub or at their place of work or study (see Table 5.2 and Appendix F3). The majority of participants (80%) received the cannabis from a friend, and smoked it as a joint (61%) (see Appendices F4 & F5).

Table 5.2

Percentage of Participants Trying Cannabis for the First Time by Context of Use

	Location where cannabis was first used							
Who with	Party	Home	Friend's	School /work	Pub/ Club	Public	Other	TOTAL
Friend	11.4 %	9.2 %	33.5 %	4.2 %	1.1 %	19.9 %	5.3 %	84.6 %
Alone	0.0 %	2.9 %	0.0 %	0.0 %	0.0 %	0.4 %	0.1 %	3.4 %
Sibling	0.4 %	2.9 %	0.4 %	0.0 %	0.0 %	0.3 %	0.0 %	4.0 %
Parent	0.1 %	1.1 %	0.0 %	0.0 %	0.0 %	0.1 %	0.0 %	1.3 %
Partner/spouse boy/girlfriend	0.3 %	1.9 %	0.7 %	0.0 %	0.2 %	0.3 %	0.1 %	3.6 %
Colleague/ acquaintance	0.1 %	0.1 %	0.2 %	0.3 %	0.0 %	0.0 %	0.3 %	1.1 %
Other	0.1 %	0.3 %	0.5 %	0.2 %	0.1 %	0.2 %	0.4 %	1.9 %
TOTAL	12.4 %	18.3 %	35.5 %	4.7 %	1.4 %	21.3 %	6.3 %	100.0 %

Reasons for Not Trying Cannabis Earlier

Participants were asked their reasons for not trying cannabis at an earlier age. The main options provided covered access to cannabis, level of interest in using, and concerns about the effects of use. An 'other reason' option was provided, as was the opportunity to report a prior lack of knowledge of cannabis. Table 5.3 displays the percentage of participants nominating each reason for not using cannabis at an earlier age.

Overall, 59% of participants reported that they had no access to cannabis prior to the occasion on which they first tried it. Of these, 45.4% said that they would have used cannabis if they had had access, with a similar number, 44.5% reporting no interest in using cannabis at an earlier age. A total of 230 (26%) participants reported having access to cannabis before they used for the first time. The majority of these participants did not try cannabis at an earlier age due to a lack of interest in the drug.

Table 5.3

Participants' Reasons for Not Using Cannabis at a Younger Age, by Gender

	Female		**Male**		**All**	
	N	%	*N*	%	*N*	%
No access						
and no interest	76	25.3 %	153	26.8 %	229	26.3 %
and worried about effects	15	5.0 %	37	6.5 %	52	6.0 %
but wanted to use	73	24.3 %	161	28.2 %	234	26.9 %
Access						
but not interested	83	27.7 %	100	17.5 %	183	21.0 %
but worried about effects	17	5.7 %	30	6.3 %	47	5.4 %
No knowledge of cannabis	27	9.0 %	65	11.4 %	92	10.6 %
Other reason	9	3.0 %	24	4.2 %	33	3.8 %

Age at First Use

Descriptive Statistics

The range for age at first use of cannabis was 7 - 55 years, with the distribution substantially skewed by a small number of outliers (n = 6) who were over 28 years old when they initiated their cannabis use. To avoid statistical complications, the age at first use for these six participants was recoded to 28 years (see Appendix F6).

Age and Gender Effects

On average, the participants were 16 years old (M = 15.99, SD = 3.09) when they first tried cannabis, with females (M = 16.14 years, SD = 2.88; N = 345) slightly older than males (M = 15.91, SD = 3.20; N = 600). A two-way ANOVA indicated that there was no difference between the genders regarding their age at initiation of cannabis use: $F(1, 944)$ =

2.55, $p = .111$, $\eta^2 = .003$. However, there was medium age effect: $F(4, 944) = 15.68$, $p < .001$, $\eta^2 = .062$. A post hoc Tukey's analysis indicated that each age group initiated cannabis use at a significantly younger age than all but the group that was just older than them. For example, the teenagers were significantly younger than all but the early twenties participants, while the mid-late twenties were significantly younger at first use of cannabis than the over forties (see Figure 5.1 & Appendices F7-F9).

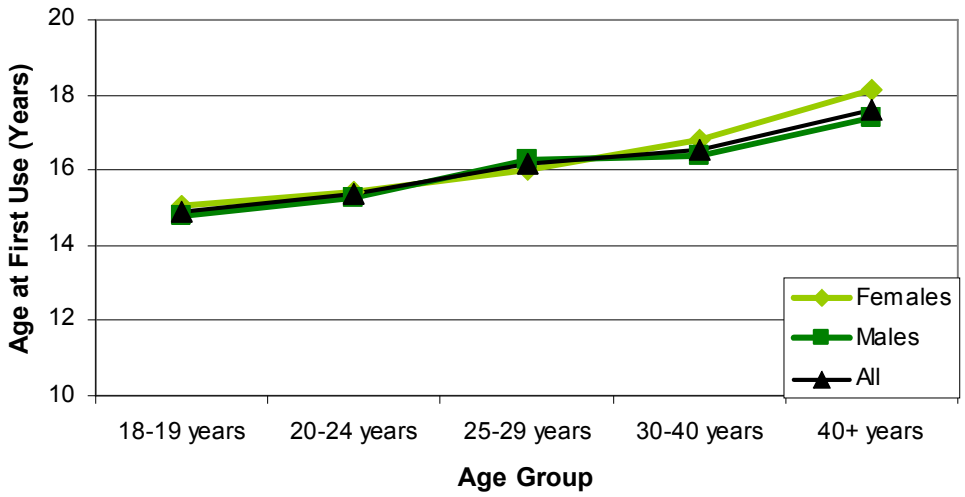

Figure 5.1. Mean age at first use of cannabis, by gender and age group

Factors Associated with Age at First Use

To gain an understanding of the nature of the association between childhood factors and early initiation of cannabis use, preliminary correlation analyses were completed (see Appendix F10). The variables found to be significantly associated with age at first use were then entered into stepwise multiple regression analyses. Two initial multiple regression analyses were completed, one each for childhood environmental and individual factors, with a final multiple regression containing the variables indicated as explaining significant

proportion of the variance in age at first use in the previous analyses. Due to the age effect reported above, this variable was included in the final multiple regression analysis.

The first stepwise multiple regression analysis, investigating associations between childhood environment factors and age of cannabis initiation, included three variables: sole parent family, family addiction problems, and sexual abuse. Two of these variables (sole parent family and family addiction problems) were retained in the final regression model, explaining just 4% of the variance in age at initiation of cannabis use: $F(2, 905) = 21.03$, $p < .001$ (see Table 5.4 and Appendix F11). However, the single parent family variable did not meet the a priori decision regarding alpha levels (i.e., $p < .01$).

The second stepwise multiple regression analysis, investigating associations with childhood individual factors, included six variables: delinquent behaviour, running away from home, psychopathology, and early use of alcohol, tobacco and other substances. The four variables retained in the final regression model (delinquent behaviour, and early use of alcohol, tobacco and other substances) explained 24% of the variance in age at initiation of cannabis use: $F(4, 937) = 75.26$, $p < .001$ (see Table 5.4 and Appendix F12).

The final stepwise multiple regression analysis contained the five of the variables identified through the previous analyses as being significantly associated with age at initiation of cannabis use, plus current age. All six of these variables were retained in the final regression model, explaining 33% of the variance in age at initiation of cannabis use: $F(6, 942) = 79.14$, $p < .001$ (see Table 5.4 and Appendix F13).

In summary, the regression results for the present study tend to suggest that childhood environment had no significant association with age at initiation of cannabis use, with the exception of exposure to family addiction problems. Rather, initiation of cannabis use was primarily associated with externalising behaviours, such as use of tobacco, alcohol, and illicit substances, and engagement in delinquent behaviours. Thus, once other factors were taken into account, the participants' age at first use of cannabis was not directly related

to whether they were raised in a single-parent family, experienced the death of someone close to them, or were abused, during childhood/ adolescence. Further, there was no direct association between the participants' age at initiation of cannabis use and the functioning of the family unit during childhood (i.e., family dynamics, domestic violence, proxy socioeconomic status), and a lack of adult support or help when needed, was also not significantly associated with age at first use once other factors were taken into consideration.

Table 5.4

Multiple Regression on Age at Initiation of Cannabis Use

	B	*SE B*	β	*t*	*p*	sr^2
Environment Factors (*Adj.* R^2 = .042)						
Family addiction problems	- 0.46	0.09	- 0.18	- 5.37	<.001	.031
Sole parent family	- 0.65	0.25	- 0.09	- 2.59	.010	.007
Individual Factors (*Adj.* R^2 = .241)						
Early substance use	- 2.30	0.27	- 0.25	- 8.60	<.001	.060
Delinquent behaviour	- 0.09	0.01	- 0.20	- 6.52	<.001	.035
Early tobacco use	- 1.28	0.20	- 0.20	- 6.51	<.001	.034
Early alcohol use	- 0.76	0.18	- 0.13	- 4.28	<.001	.015
Final Regression Model (*Adj.* R^2 = .332)						
Age group	0.64	0.06	0.28	10.61	<.001	.080
Early substance use	- 2.39	0.26	- 0.26	- 9.30	<.001	.062
Early tobacco use	- 1.41	0.19	- 0.21	- 7.53	<.001	.040
Delinquent behaviour	- 0.08	0.01	- 0.17	- 6.04	<.001	.026
Early alcohol use	- 0.88	0.17	- 0.14	- 5.20	<.001	.019
Family addiction problems	- 0.23	0.07	- 0.09	- 3.29	.001	.008

However, externalising behaviours, such as delinquent behaviour and early substance use, have been linked to unsatisfactory home environments (e.g., Rey, Walter, Plapp, &

Denshire, 2000). Thus, it is possible that associations between childhood environmental factors and age at initiation of cannabis use were actually indirectly mediated through individual behaviours. For example, a disadvantaged, destructive, and/or dysfunctional childhood environment may lead to 'acting out' or externalising behaviours in some children and adolescents, these behaviours may then be associated with early age at initiation of cannabis use. This premise was investigated in relation to delinquent behaviour.

Delinquent Behaviour. Preliminary correlation analyses indicated that seven of the nine childhood environment factors were significantly associated with delinquent behaviour (see Appendix F14). Thus, the seven identified variables (sole parent family, proxy SES, family addiction problems, lack of adult support, death of someone close, and physical and sexual abuse) were entered into a stepwise multiple regression analysis. Four of these variables (lack of adult support, family addiction problems, death of someone close, and sole parent family) were retained in the final regression model, explaining 12% of the variance in delinquent behaviour: $F(4, 894) = 31.46$, $p < .001$ (see Table 5.5 and Appendix F15).

Table 5.5

Multiple Regression on Delinquent Behaviour

	B	*SE B*	β	*t*	*p*	sr^2
Environment Factors (*Adj.* $R^2 = .120$)						
Lack of adult support	0.93	0.15	0.21	6.52	<.001	.042
Family addiction problems	0.88	0.17	0.17	5.21	<.001	.027
Death of someone close	1.60	0.43	0.12	3.72	<.001	.014
Sole parent family	1.30	0.48	0.09	2.70	.007	.007

Thus, the multiple regression results suggest that early age at initiation of cannabis use was associated with using alcohol, tobacco and illicit substances before the age of 16 years, engaging in delinquent behaviour during childhood/adolescence, and exposure to

family addiction problems. In turn, delinquent behaviour appears to be related to a lack of adult support or help when needed, exposure to family addiction problems, the death of someone close, and growing up in a sole parent family.

Summary & Discussion

Chapter Summary

This Chapter provided a detailed examination of the participants' initiation to cannabis use, thus addressing the second objective of the present study: to increase knowledge about, and understanding of, the nature of cannabis use.

The vast majority of participants in this study had tried cannabis at least once. Most study participants did not have access to cannabis before they first used it, with many of them stating that they had a desire to use cannabis before the opportunity actually presented itself. Curiosity was typically the motivation behind trying cannabis, with most participants making a prior decision to use cannabis on the specific occasion they did, and feeling excited at the prospect. However, approximately 20% of participants were unsure or worried about using cannabis, and a small proportion felt pressured to use. The most commonly reported circumstances surrounding the participants' first experience were obtaining the cannabis from a friend and using it with a friend at a friend's house. Thus, for most participants, trying cannabis was a planned activity: it was undertaken willingly, with the cannabis sourced from someone they trusted, and used in a context when they presumably felt safe.

Further, most participants reported getting high or stoned on this first occasion, and this experience tended to be better than was expected. In contrast, the one-quarter of participants who reported that cannabis had no effect were more likely to report disappointment, while only a small number of participants had an adverse reaction.

The average age for first cannabis use in this study was 16 years, but the range of ages at which participants initiated cannabis use was large. A medium age effect was indicated, with younger participants tending to have initiated use earlier than older participants. Age at initiation of cannabis use was associated with using alcohol, tobacco and illicit substances before the age of 16 years, engaging in delinquent behaviour during childhood/adolescence, and exposure to family addiction problems. While, delinquent behaviour was found to be related to a lack of adult support or help when needed, exposure to family addiction problems, the death of someone close, and growing up in a sole parent family. Thus, it appears that both childhood environmental and individual factors were associated with the age at which participants first used cannabis, in that environmental factors were associated with involvement in delinquent behaviour, and these behaviours, in turn, predicted initiation of cannabis use.

Comparison Data

First Use of Cannabis

A friend or acquaintance was reported as supplying cannabis for first occasion of use by 80% of the participants in the Australian *2004 National Drug Strategy Household Survey* (AIHW, 2005). Similarly, 81% of the present sample reported receiving the cannabis from a friend or acquaintance. Further, being supplied by a family member was reported by 11% of the Australian sample and 8% of the present sample, however a slightly higher proportion of the Australian sample sourced their cannabis from a dealer: 6%, compared to 4% of the present sample.

As with the present sample, curiosity was the most commonly reported reason for initial cannabis use in Copeland et al.'s (2001) treatment sample and the Australian general population sample (AIHW, 2005). The next most common reason reported by the treatment sample was availability. However, 26% of the participants in the present study reported

having access to cannabis prior to their first use of the substance, but chose not to use it. The main reason for not using cannabis at an earlier age was lack of interest in doing so, which was reported by 47% of participants in the present study. This was also the most commonly reported reason for not using cannabis in the Australian population study, with 75% of participants endorsing this reason (AIHW, 2005). Peer pressure was the third most common reason given by Copeland et al.'s sample, and the second most common reason for the Australian population sample (reported by 55% of participants), for their initiation of cannabis use. Interestingly, only 4% of the present sample reported feeling pressured to use on their first time.

Age at Initiation of Cannabis Use

Data for the present study indicates that teenage (18-19 year olds) participants initiated their use at 14.9 year of age, those in their early twenties first used at 15.3 years, participants in their early twenties were 16.2 years old, those in their thirties were 16.5, while participants over the age of forty were 17.6 years old when they first used cannabis. This age effect reflects the trend seen in general population data for Australia and the USA (AIHW, 2005; SAMHSA, 2006). For example, the average age at initiation of cannabis use is 14.9 years for 12-19 year old Australians whereas, for those who are over 20 years of age, the mean was 19.1 years (AIHW, 2005). Thus, the teenage participants in the present study matched the teenage sample in the Australian survey, but the mean age at initiation of use for the older participants in the present study fell at least 2.5 years below that for population estimates for Australians aged 20 years and older. For the older age groups, the present sample is perhaps more similar to American population estimates. That is, 12-21 year old Americans have an average age at initiation of cannabis use of 16.0 years, and were an average age of 17.4 years at initiation of use for 12-49 year olds (SAMHSA, 2006).

With reference to other cannabis-using research samples, the same mean age at initiation of cannabis use as reported by the present sample (16.1 years) was reported for non-problematic cannabis users assessed by Caldeira, Arria, O'Grady, Vincent, and Wish (2008). These authors found that, within a sample of 474 weekly cannabis users, age at initiation of cannabis use decreased with increasing DSM-IV cannabis disorder criteria. Hence, diagnostic orphans initiated use at 15.8 years of age on average, participants meeting criteria for cannabis abuse initiated use at 15.3 years of age, while the dependent participants were 14.9 years old on average when they first used cannabis.

In line with these findings, Copeland, Swift, and Rees (2001) reported that the mean age of first use for a treatment-seeking sample (N = 229), where 97% of participants met dependence criteria, was 15 years. Further, the previously discussed urban cannabis-using sample (Swift, Hall, & Copeland, 1998, 2000), where 72% of participants were classified as dependent, also had a mean age of 15 years at initiation of cannabis use. In contrast, the mean age of first use was 17 years for the rural sample of cannabis users discussed in previous chapters (Reilly, Didcott, Swift, & Hall, 1998; Swift, Hall, Didcott, & Reilly, 1998). In comparison to the other research samples discussed here, at 57%, the rural sample had a substantially lower proportion of participants diagnosed with cannabis dependence. This association between age at initiation of use and subsequent dependence on the substance is often reported in the literature, thus it is of interest that mean age at first use for the present sample was exactly the same as that reported for Caldeira et al.'s non-problematic cannabis users. This association will be investigated for the present study sample in Chapter 7.

Factors Associated with Age at Initiation of Cannabis Use

The childhood factors that were found to contribute significantly in explaining the variance in age at first use of cannabis in the present study were similar to those reported by Rey, Sawyer, Raphael, Patton, and Lynskey (2002), McGee, Williams, Poulton, and Moffitt.

(2000), von Sydow, Lieb, Pfister, Hofler, and Wittchen (2002), and Coffey, Lynskey, Wolfe, and Patton (2000). Rey et al. assessed cannabis use and a range of environmental and individual risk factors in a sample of 1490 Australian 13-17 year olds. The study by McGee et al. evaluated a sample of New Zealand adolescents from the age of 15 to 21 years as part of the Dunedin Multidisciplinary Health and Development Study. The third comparison group consisted of 1717 German 14-24 year olds who were assessed by von Sydow et al. (2002) as part of the Early Developmental Stages of Psychopathology (EDSP) longitudinal study, which investigated cannabis initiation and progression to dependence on the substance. Finally, Coffey, Lynskey, Wolfe, and Patton (2000) also used a longitudinal design to investigate initiation and progression of cannabis use. Their sample population included 2032 Australian high school students (initially aged 14-15 years) who were participants in the Victorian Adolescent Health Cohort (VAHC) Study.

In these four studies, tobacco and alcohol use were significantly associated with the initiation of cannabis use. Rey et al. (2002) also found that the use of other illicit substances were significantly associated with cannabis use after adjustment for other variables in their study. All four studies also found that conduct disorder/ antisocial behaviour was significantly associated with initiation of cannabis use. This latter finding is supported by Stenbacka's (2003) results which indicated that behavioural issues, such as having contact with the police, conduct problems at school, truancy, and running away from home, were significantly associated with cannabis use.

In contrast to the present study, Rey et al. (2002) and von Sydow et al. (2002) reported significant associations in their final regression model between age at first use and both growing up in a sole parent family, and being diagnosed with a psychological disorder. Coffey et al. (2000) also found that having divorced or separated parents was significantly associated with initiation of cannabis use in their final regression model, but psychiatric morbidity was only significantly associated in prior univariate analyses. Neither of these

factors were significant in the final multiple regression model in the present study, although it is worth noting that growing up in a single-parent family was a significant predictor of age of initiation when only environmental variables were included in the regression analysis.

Conclusions

Approximately 10% of study participants reported that concern about the effects of cannabis use prevented them from initiating at a younger age. Thus, it appears that anti-drug use and health education campaigns may prevent use or result in delayed initiation in some people. However, with almost half of study participants reporting that they did not use earlier because of a lack of interest in doing so, determining what prompted the this level of interest to change is of key importance for preventing or delaying the initiation of cannabis use.

The results presented in the present chapter indicate that, for early initiators, cannabis use was part of a broader pattern of externalising behaviour, as has been suggested by the findings of other researchers (e.g., Coffey et al., 2000; McGee et al., 2000; Rey et al., 2002; von Sydow et al., 2002). While, externalising behaviours have been found to be the byproduct of unsatisfactory life circumstances (Rey et al., 2000). In the present study, these circumstances appear to be a lack of available adult support or help when needed, exposure to family addiction problems, childhood trauma (i.e., the death of someone close to them), and coming from a single parent family. Evidently, the latter two variables are likely to be linked for a number of participants, with 5% of the sample reporting the death of a parent during childhood.

The patterns of associations between the factors indicate that cannabis use-related preventative and early intervention strategies need to focus on more than just the individual's externalising behaviour, rather seeing these actions as possible symptoms of underlying problems. As such, preventative strategies would be best focused on improving the home environment of those who are beginning to exhibit delinquent behaviours (e.g., being truant

from school). For example, the home environment could be improved by: treating parents with addictions; improving supportive networks within the family, or providing adult support outside of the family (e.g., mentors); and providing individuals with psychological treatment to aid recovery from trauma.

Early intervention strategies may be more appropriate for individuals who have gone beyond the occasional use of cannabis and are using in a harmful manner. Although, while they are living within the home environment the same issues would continue to have an impact, thus psychological interventions would be essential. Without such intervention, individuals initiating cannabis use during early to mid adolescence have been found to be at a greater level of risk for experiencing adverse outcomes, such as dependence, than individuals who started using the substance at a later point in their lives (Caldeira et al., 2008; Fergusson & Horwood, 1997; Swift, Hall, Didcott et al., 1998). Thus, it is seems plausible that the key childhood factors identified above may also be predictive of heavy, prolonged and dependent use. This premise will be explored in Chapter 7; however the participants' current patterns of cannabis will be explored first, in the next chapter.

CHAPTER 6

CURRENT PATTERNS OF CANNABIS USE

Introduction

The second objective of the present study is to increase knowledge about, and understanding of, the nature of cannabis use. While the participants' initiation to cannabis use was covered in Chapter 5, the present Chapter contains a detailed examination of the study participants' current patterns of cannabis use. The heavy, prolonged, and dependent use of cannabis will be discussed in the next Chapter, followed by exploration of motives for cannabis use and subjective experiences of use, in Chapter 8.

As noted in Chapter 1, past cannabis use studies have typically focused on only one or two aspects of use, such as frequency of use, dependence, or early onset of use. Thus, we do not have detailed knowledge about many facets of cannabis use (e.g., subjective experiences of use), and know less about overall patterns of use, particularly in relation to the under researched population of hidden users. It is believed that this information will demonstrate the presence of heterogeneity in the patterns of cannabis use. Further, it is probable that at least some of the research-neglected cannabis use factors are associated with adverse use-related issues. As such they may shed light on the individual differences in outcomes and cannabis use-related issues that are evident in the general population, particularly in relation to everyday functioning. These premises will be explored further in relation to the participants' everyday functioning, in Chapters 9 and 10.

A total of 795 (80%) participants reported cannabis use in the previous 12 months. This Chapter investigates the current patterns of cannabis use of these participants, including an exploration of their rate of cannabis use, issues of quantity and quality of cannabis consumed, the contexts in which cannabis is used, insights into recent use or non-use of

cannabis, and expectations regarding future cannabis use. The final section of the present chapter provides a summary of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample population in context, both in relation to cannabis-using populations and the general population.

Rate of Use, Quantity, & Quality

Frequency of Use

Of the 795 participants (259 females and 536 males) who reported cannabis use in the previous 12 months, 52% had used cannabis in the week prior to participating in the present study, and a further 38% had used cannabis in the previous 4 weeks (see Appendix G1). Participants were most likely to report using cannabis on a daily basis (36%), followed by use on most days (24%), and weekly use (19%) (see Figure 6.1 and Appendix G2).

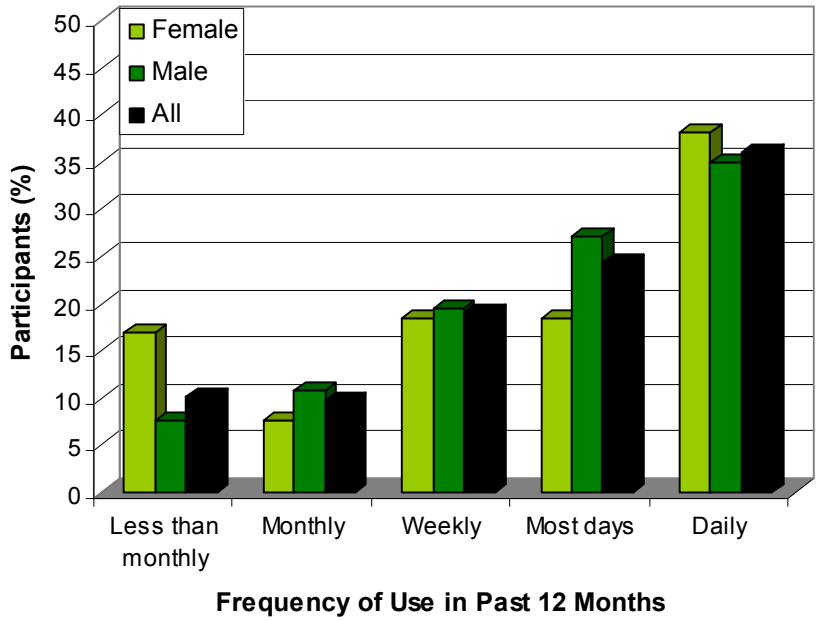

Figure 6.1. Frequency of cannabis use in the previous 12 months, by gender

Frequency of use in the previous 12 months was scored from 1-5 ('less than monthly' to 'daily'), with higher scores indicating more frequent use. The mean frequency of use score for participants was 3.65 (*SD* = 1.34). A two-way ANOVA indicated that there were no significant age, gender or interaction effects (see Appendices G3 & G4).

Weekly Patterns of Use

Of the 718 participants reporting cannabis use in the previous four weeks, 70% consumed cannabis every day in a typical week (see Figure 6.2 and Appendix G5). On average, these participants used cannabis 5.97 days per week (*SD* = 1.82). When all participants reporting current cannabis use were included, with those not using in the previous four weeks receiving a score of 0, the mean was 5.39 days per week (*SD* = 2.47). A two-way ANOVA indicated that there were no significant age, gender, or interaction effects for this variable (see Appendices G6 & G7).

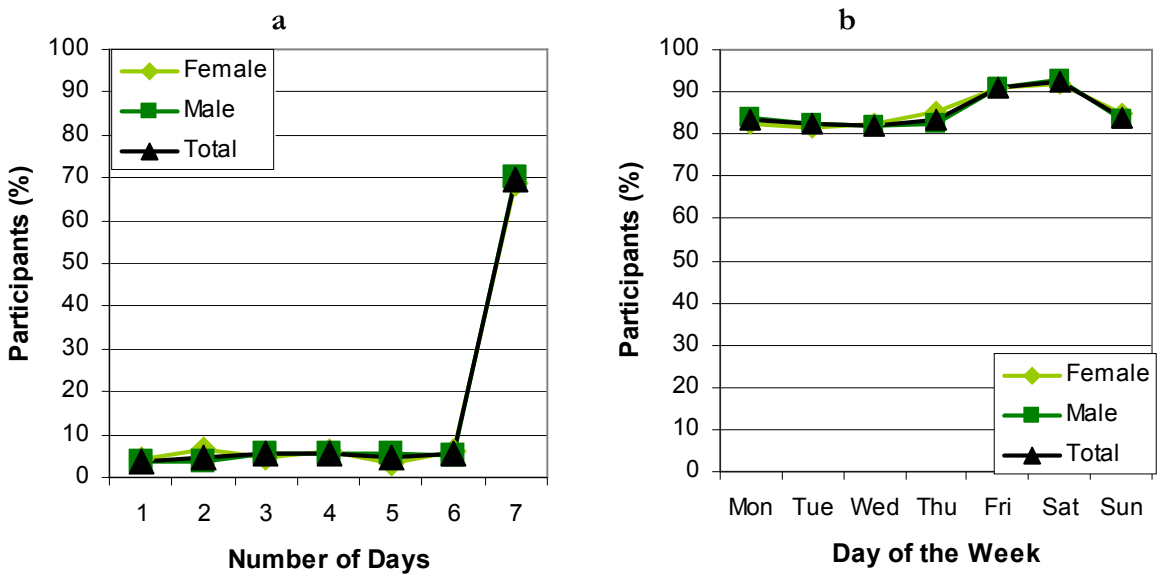

Figure 6.2. Number of days per week (a) and days of the week (b) that cannabis was used by percentage of participants and gender.

Cannabis was typically used on each day of the week by more than 80% of the 718 participants reporting cannabis use in the previous four weeks. As is evident in Figure 6.2, the most common days for cannabis use were Friday and Saturday, with 91% and 92% of participants using on these days, respectively (see Appendix G8).

The most typical time of day for participants to use cannabis was 6-9 pm (62%), followed by 9 pm-12 am (53%), with the lowest percentage of participants using between 5 am and 8 am (9%). There was a trend for relatively stable levels of use between Monday and Thursday, with the percentage of participants using cannabis increasing from 6 pm Friday night, peaking on Saturday, and returning to normal levels by 6 pm on Sunday night (see Figure 6.3 and Appendix G9).

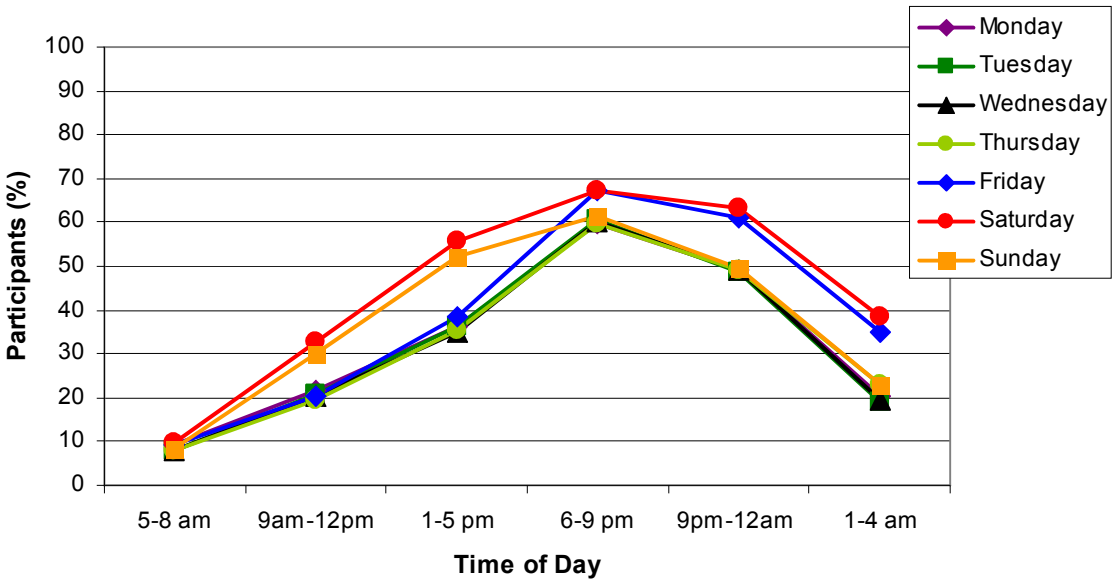

Figure 6.3. Time of day that cannabis was used by day of the week.

Weekly Number of Cones/Joints

There was a great disparity in the number of cones or joints consumed per week by the 718 participants who had used cannabis in the previous four weeks, ranging from 1 to

301 cones/joints consumed per week. The modal response of 10 joints/cones was nominated by 19% of the participants and the median was 15.5 joints/cones, however the mean number of cones/joints consumed per week was 32.05 (*SD* = 42.10). Thus, to improve the normality of this variable, the data was recoded into 11 usage level categories (scored: 1-11), as depicted in Figure 6.4 (see Appendices G10 & G11). Using this scoring system, the mean usage score for the participants was 5.31 (*SD* = 2.35). A two-way ANOVA indicated that there were no significant age, gender, or interaction effects (see Appendices G12 & G13).

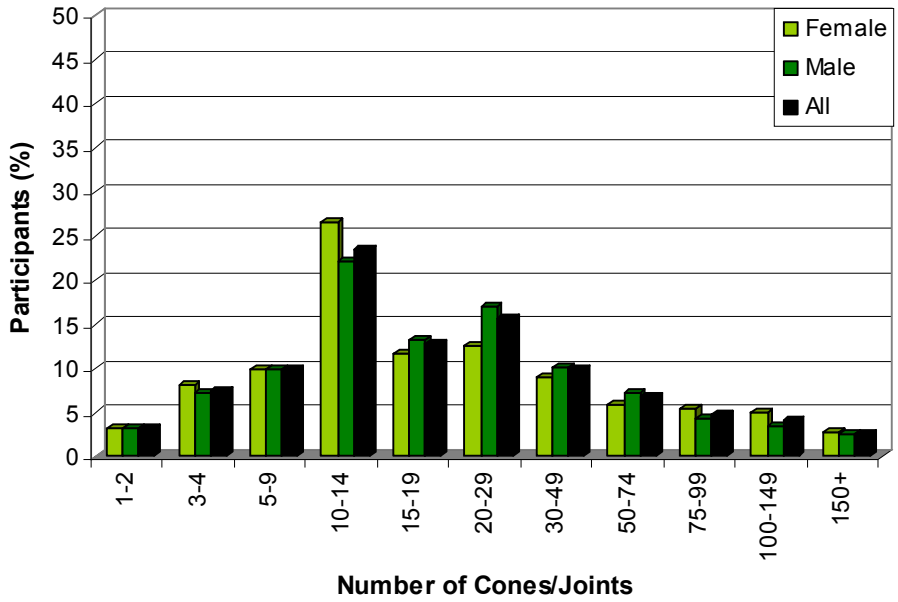

Figure 6.4: Number of cones/joints consumed per week by percentage of participants and gender.

Cannabis Type and Method of Administration

While 29% of participants primarily used hydroponic cannabis, and 11% primarily consumed naturally grown (or 'bush') cannabis, the majority of participants (59%) used cannabis cultivated via both methods. Participants were most likely to consume the

heads/buds of the cannabis plant (67%) primarily, with few primarily using hashish (or 'resin'; 7%) or leaf (4%). Almost a quarter of participants (22%) reported no primary cannabis preparation type. The method of administration most commonly used by participants was smoking the cannabis as a joint (36%), followed by smoking it in a pipe (24.1%). However, 23.9% of participants reported no primary method of administration, and the remaining 16% used a bong to smoke cones of cannabis (see Figure 6.5 & Appendix G14).

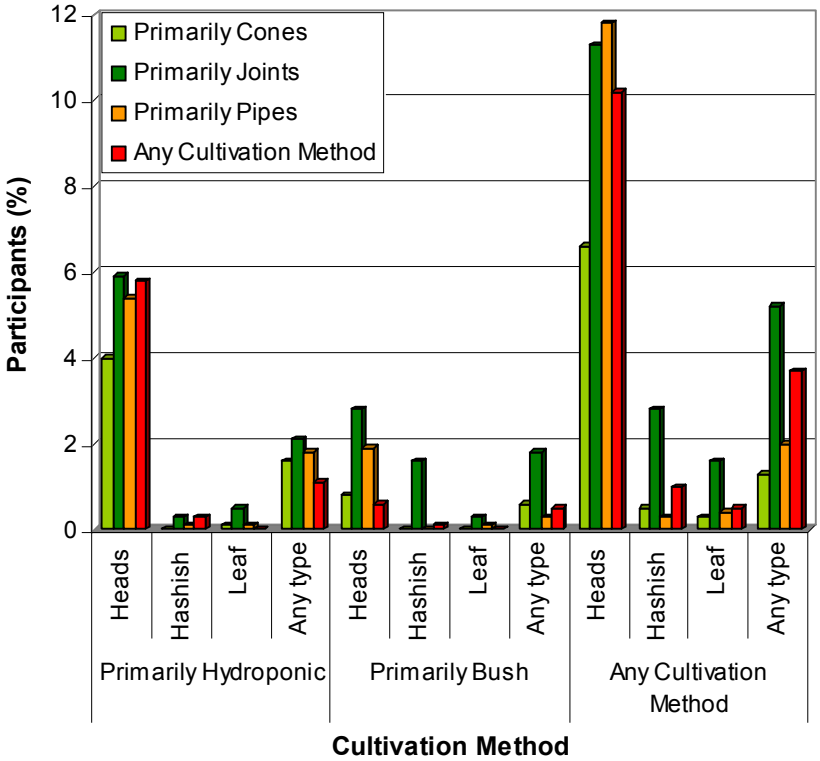

Figure 6.5. Primary type of cannabis consumed and method of administration by percentage of participants.

Potency, Strength, & Dose

Cannabis Potency

Approximate cannabis potency was calculated using the participants' potency ratings for cannabis they consumed and usage data. Participants were asked to report how often they used cannabis that was very weak, fairly weak, moderate, fairly strong, very strong, and extremely strong on a 5-point scale ('never' to 'every time'). Responses were weighted from 1 to 6 for potency and 0 to 4 for frequency of use to determine an average level of cannabis potency for each of the 795 participants who reported cannabis use in the previous 12 months (see Table 6.1).

Table 6.1

Calculating the Average Potency of Cannabis Consumed by the Participants

	Frequency				
Potency	Never (weighted 0)	Rarely (1)	Sometimes (2)	Mostly (3)	Every time (4)
Very weak (1)	0	1	2	3	4
Fairly weak (2)	0	2	4	6	8
Moderate (3)	0	3	6	9	12
Fairly strong (4)	0	4	8	12	16
Very strong (5)	0	5	10	15	20
Extremely strong (6)	0	6	12	18	24

To illustrate this weighting procedure: a participant reporting using very strong cannabis (potency weighting of 5) every time (frequency rating of 4) was assessed as consuming joints/cones with an average potency value of 20 (5 x 4). While a participant who consumed fairly weak cannabis (potency = 2) most of the time (frequency = 3) and used fairly strong cannabis (potency = 4) rarely (frequency = 1) was assessed as consuming

joints/cones with an average potency of 10 (2 x 3 + 4 x 1). A participant could report frequencies of use up to a total of 4. That is, if they reported 'always' (frequency rating of 4) using a certain strength of cannabis, they could not also report 'sometimes' (frequency rating of 2) using a different strength of cannabis. However, they could report using four different potencies 'rarely' (4 x 1), two different potencies 'sometimes' (2 x 2), or one potency rarely and another mostly (1 + 3). Thus, average potency scores had a maximum potential range of 4 ('very weak' 'every time') to 24 ('extremely strong' 'every time'). Using this scoring system, the mean potency of cannabis consumed by the participants was 16.58 (*SD* = 3.69). A two-way ANOVA indicated that there were no significant age, gender, or interaction effects (see Appendices G15 & G16).

Proportion of Cannabis in Cones/Joints

The approximate proportion of cannabis in the cones/joints consumed by participants was calculated using data relating to participant use of tobacco as 'spin'. Participants were asked to report how often their cone/joint consisted of various ratios of tobacco to cannabis. The levels of tobacco consumed as 'spin' were: no tobacco; less than a quarter tobacco; a quarter to less than a half (i.e., approximately a third); half tobacco; more than half to three-quarters tobacco (i.e., approximately two-thirds); and more than three-quarters tobacco. The frequency of use of these levels of tobacco was rated on a 5-point scale ('never' to 'every time'). Responses were weighted from 0.13 to 1.00 for cannabis content (i.e., 13% - 100%) and 0.00 to 1.00 for frequency of use to determine an average proportion of cannabis in the cones/joints consumed by each of the 795 participants who reported cannabis use in the previous 12 months (see Table 6.2).

Table 6.2

Calculating the Average Proportion of Cannabis in the Cones/Joints Consumed by Participants

	Frequency				
Proportion of Cannabis	Never (weighted 0.00)	Rarely (0.25)	Sometimes (0.50)	Mostly (0.75)	Every time (1.00)
< One-quarter (0.13)	0.00	0.03	0.07	0.10	0.13
Approx. one-third (0.33)	0.00	0.08	0.17	0.25	0.33
Half (0.50)	0.00	0.13	0.25	0.38	0.50
Approx. two-thirds (0.67)	0.00	0.17	0.34	0.50	0.67
> Three-quarters (0.88)	0.00	0.22	0.44	0.66	0.88
Cannabis only (1.00)	0.00	0.25	0.50	0.75	1.00

Similarly to above, participants could report frequencies of use up to a total of 1.00. Thus is, if they reported 'mostly' (frequency rating of 0.75) using a certain proportion of cannabis, they could not also report 'sometimes' (frequency rating of 0.50) using a different proportion of cannabis. The average proportion of cannabis scores had a maximum potential range of 0.13 ('< a quarter cannabis' 'every time') to 1.00 ('cannabis only' 'every time'). Using this scoring system, the mean proportion of cannabis contained in each cone/joint was 0.85 (SD = 0.23); thus, 85% cannabis to 15% tobacco. This high mean score was due to the majority of participants (57%) reporting that they never added tobacco to their cones/joints. A two-way ANOVA indicated that there was a small but significant age effect, with participants in their thirties (M = 0.79, SD = 0.28) using a lower proportion of cannabis in their cones/joints than the participants aged forty years or over (M = 0.91, SD = 0.20): $F(4, 787) = 4.62$, $p = .001$, $\eta^2 = .023$. No significant gender or interaction effects were indicated (see Appendices G17 - G19).

Strength of Cones/Joints

An approximation of the strength of the cones/joints consumed by participants was calculated by multiplying each participant's individual average potency score with their average proportion of cannabis score. It is important to note here that this calculation hinges on a broad (and potentially erroneous) assumption that the participants tended to roll joints and pack cones and pipes that were of approximately the same volume. Nevertheless, the maximum possible scoring range was 0.52 (min. potency of 4 x min. proportion of 0.13) to 24.00 (max. potency of 24 x max. proportion of 1.00). Using this method of calculation, the mean strength of cones/joints consumed by participants was 14.21 (*SD* = 5.22). Unsurprisingly, the small age effect present in relation to the proportion of cannabis scores was also indicated for in a two-way ANOVA investigating strength of the cones/joints consumed by the participants. No significant gender or interaction effects were indicated (see Appendices G20 – G22).

Cannabis Dose

Approximate cannabis dose was calculated for all participants reporting use within the previous 4 weeks. This cannabis dose was calculated by multiplying each participant's approximate strength of cones/joints by the total number of cones/joints consumed each week. This figure was then divided by 7 to gain an approximate daily cannabis dose. It is important to note that this is not the same as THC dose, which could not be reliably calculated in this study without additional information relating to the amount of THC in the cannabis used on each occasion by each participant.

Due to the great disparity in the number of cones/joints consumed by participants, the cannabis dose scores also ranged widely: from 0.78 to 660.00 (*M* = 63.49, *SD* = 87.61). Thus, to improve the normality of this variable, the data was recoded into 11 daily dose categories (scored: 1-11), as depicted in Figure 6.6 (see Appendices G23 & G24).

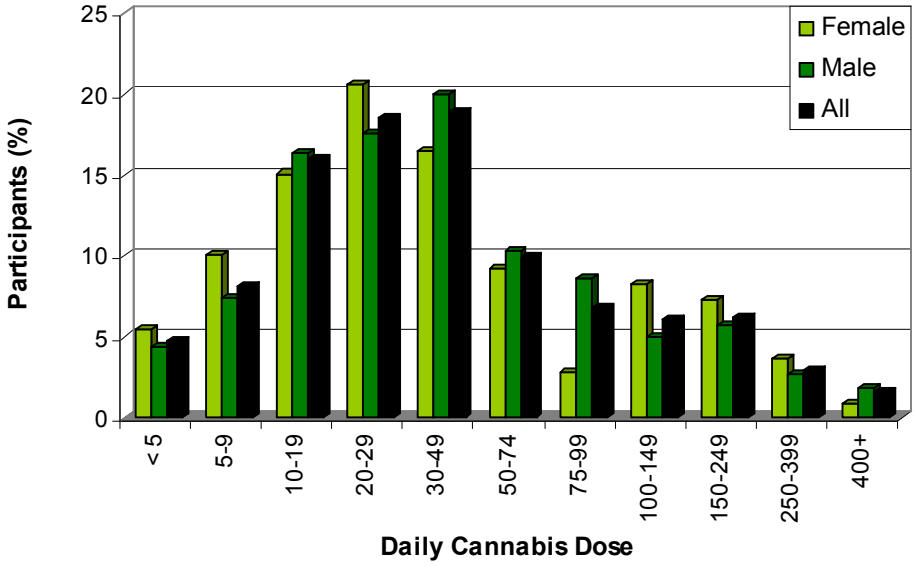

Figure 6.6: Daily cannabis dose by percentage of participants and gender.

Using this scoring system, the mean daily cannabis dose for the participants was 4.97 (*SD* = 2.36). A two-way ANOVA indicated that there were no significant age, gender, or interaction effects (see Appendices G25 & G26).

Cannabis Intoxication

Participants who had consumed cannabis in the previous 12 months were asked to report both the normal and highest levels of intoxication they usually experienced. Participants normally tended to get a little stoned or high (35%) or use just enough to get relaxed (26%) or uninhibited (21%). Few participants reported their normal level of intoxication as being moderately (13%) or very (3%) stoned or high. However, participants were most likely to report getting moderately (44%) or very (31%) stoned or high at their highest level of intoxication, with a much small proportion of participants reporting lower levels. The most common pattern of intoxication, reported by 19% of participants, was normally getting a little stoned or high and getting moderately stoned or high at the highest

level of intoxication. Approximately 10% of participants reported that their normal level of intoxication was also their highest level (see Figure 6.7 & Appendix G27).

Using a 6-point scale (0-5; 'not intoxicated' = 0), the mean normal level of intoxication for the participants was 2.38 (*SD* = 1.15), while the mean highest level of intoxication was3.90 (*SD* = 1.07). Two-way ANOVAs indicated age effects for both levels of intoxication; with a large effect for normal level of intoxication and a medium-sized effect for the highest level: $F(4, 782) = 23.35, p < .001, \eta^2 = .104$ and $F(4, 783) = 8.09, p < .001, \eta^2 = .039$, respectively. No significant gender or interaction effects were indicated in relation to either level of intoxication (see Appendices G28 & G29 and G31 & G32, respectively). Post hoc Tukey HSD analyses indicated that both normal and highest levels of intoxication decreased progressively with increasing age (see Figure 6.8 and Appendices G30 & G33).

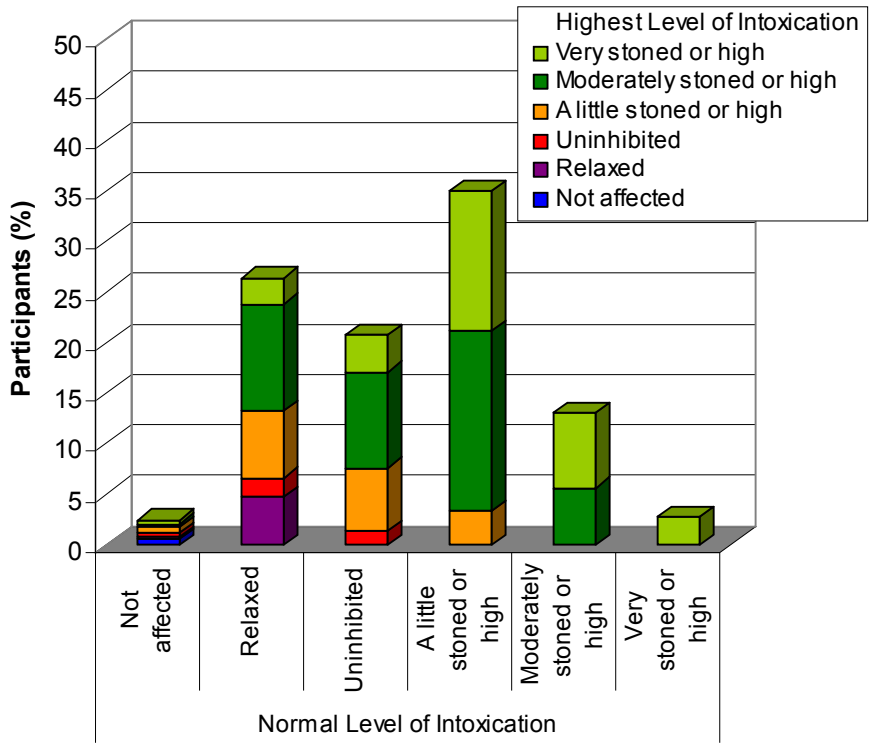

Figure 6.7. Normal and highest levels of intoxication experienced by percentage of participants.

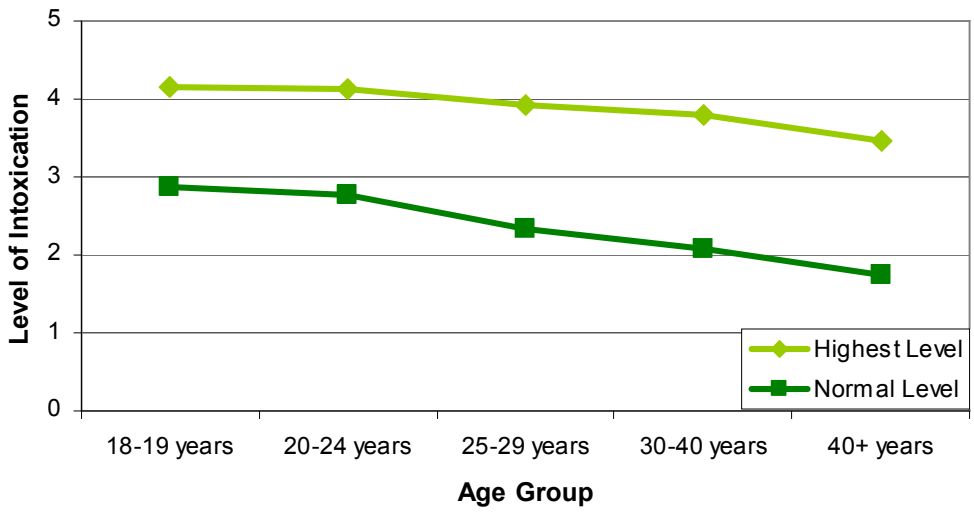

Figure 6.8. Normal and highest levels of intoxication by age group.

Context of Use

Social & Physical Context of Use

All participants who had consumed cannabis in the previous 12 months were asked about the context in which they used it (see Table 6.3). Participants were most likely to use cannabis with friends or on their own, and were unlikely to use with family members and strangers. However, more than half of the participants sometimes used cannabis with colleagues or acquaintances, and many sometimes used with strangers.

In general, participants used at home or at a friend's home, and rarely used cannabis at their place of work or study or in a pub or nightclub. Interestingly, while few participants mostly or always used cannabis in public areas (e.g., parks, beaches), almost two-thirds of the participants did so sometimes. Similarly, while very few participants regularly used cannabis at their place of work or study, approximately a quarter of the participants sometimes used in these places (see Table 6.3).

Table 6.3

Context in which Participants Used Cannabis in the Previous 12 Months

	Mostly or Always		**Sometimes**		**Never**	
	N	%	*N*	%	*N*	%
People						
Friend/s	403	51.5 %	340	43.4 %	40	5.1 %
No-one (Alone)	340	43.1 %	356	45.2 %	92	11.7 %
Partner/spouse or boy/girlfriend	231	29.5 %	187	23.9 %	356	46.6 %
Colleagues or acquaintances	47	6.0 %	421	53.8 %	315	40.2 %
Family members	36	4.6 %	239	30.5 %	508	64.9 %
Strangers	11	1.4 %	336	42.9 %	436	55.7 %
Places						
Home	582	74.4 %	159	20.3 %	41	5.2 %
Friend's home	234	29.9 %	467	59.7 %	81	10.4 %
Party	120	15.3 %	431	55.1 %	231	29.5 %
In public areas	91	11.6 %	491	62.8 %	200	25.6 %
Place of work or study	43	5.5 %	207	26.5 %	532	68.0 %
Pub or nightclub	32	4.1 %	225	28.8 %	525	67.1 %

Solitary use. A context of use variable assessing solitary cannabis use was employed in the present study. This variable was scored on a 5-point scale, from 0 = 'never use alone' to 4 = 'always use alone'. The participants' man score for this variable was use score was 2.13 (*SD* = 1.10). A two-way ANOVA indicated a small age effect, with participants aged in their thirties (*M* = 2.32, *SD* = 0.96) and over forty (*M* = 2.33, *SD* = 1.04) being more likely to use cannabis alone that teenaged participants (*M* = 1.84, *SD* = 1.15): $F(4, 772) = 4.96$, $p = .001$, $\eta^2 = .025$. No significant age or interaction effects were indicated (see Appendices G34-G36).

Peer Cannabis Use

All participants (N = 989) were asked about how many of their friends used cannabis, and were provided with five response options: 'none', 'a few', 'many', 'most', and 'all'. Participants were most likely to report that a few (34%) or most (32%) of their friends used cannabis, while 20% reported having many cannabis-using friends. Only 7% of participants reported that none or all of their friends used cannabis.

With the response options were scored on a 5-point scale (0-4; 'none' = 0), the participants' mean peer cannabis use score was 1.97 (SD = 1.10). A two-way ANOVA indicated a small gender effect, with male participants (M = 2.09, SD = 1.08) having more cannabis-using friends than female participants (M = 1.79, SD = 1.11): $F(1, 988) = 19.88$, $p < .001$, $\eta^2 = .019$. A medium-sized age effect was also indicated ($F[4, 988] = 11.17$, $p < .001$, $\eta^2 = .043$), with peer cannabis use decreasing progressively with increasing age (see Figure 6.9 and Appendices G37-G39).

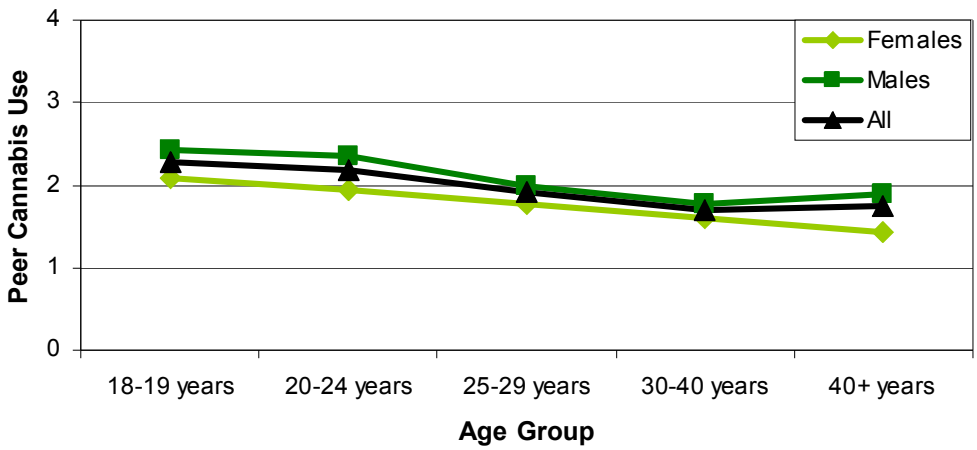

Figure 6.9. Peer cannabis use by age and gender.

Concurrent Substance Use

Participants were asked to report how often they consumed other substances in conjunction with cannabis in the previous 12 months (see Table 6.4). The majority of participants reported sometimes using alcohol in conjunction with cannabis use, but never using other substances (e.g., ecstasy and cocaine). The participants were more disparate in relation to tobacco, with 40% mostly or always using it concurrently with cannabis, and 41% never using the two substances at the same time. It is important to note here that 35% of participants were daily smokers. Further, participants were instructed not to include the use of tobacco as 'spin' when responding to the concurrent tobacco-use item.

All three types of concurrent substance use were scored on a 3-point scale (0-2; 'never' = 0). The participants' mean concurrent tobacco use score was 0.99 (SD = 0.90), the mean concurrent alcohol use score was 0.93 (SD = 0.60), and the mean concurrent substance use score was 0.43 (SD = 0.57). Three two-way ANOVAs were completed to investigate possible age and gender effects. The first of these ANOVAs indicated that female participants (M = 1.14, SD = 0.90) used tobacco concurrently with cannabis more often than the male participants (M = 0.91, SD = 0.89): $F(1, 789) = 9.83$, $p = .002$, $\eta^2 = .012$. However, no significant age or interaction effects were indicated (see Figure 6.10 and Appendices G40 & G41).

Table 6.4

Concurrent Substance Use in the Previous 12 Months

	Mostly or Always		**Sometimes**		**Never**	
Substance	*N*	%	*N*	%	*N*	%
Tobacco	307	39.6 %	155	20.0 %	314	40.5 %
Alcohol	115	14.8 %	490	63.1 %	172	22.1 %
Other substances	30	3.8 %	273	35.0 %	477	61.2 %

In contrast, age effects were indicated in relation to the concurrent use of alcohol ($F[4, 780] = 3.95$, $p = .004$, $\eta^2 = .020$), but no significant gender or interaction effects were indicated (see Appendices G42 & G43). Similarly, age effects were indicated in relation to the concurrent use of other substances ($F[4, 783] = 5.81$, $p < .001$, $\eta^2 = .029$), and no significant gender or interaction effects were indicated (see Appendices G45 & G46). Post hoc Tukey HSD analyses indicated that the participants who were aged forty years and older were less likely to use alcohol and cannabis concurrently than younger participants, with the exception of those aged in their mid-late twenties (see Appendix G44), and were significantly less likely to use other substances in conjunction with cannabis than participants aged in their twenties or younger (see Figure 6.10 and Appendix G47).

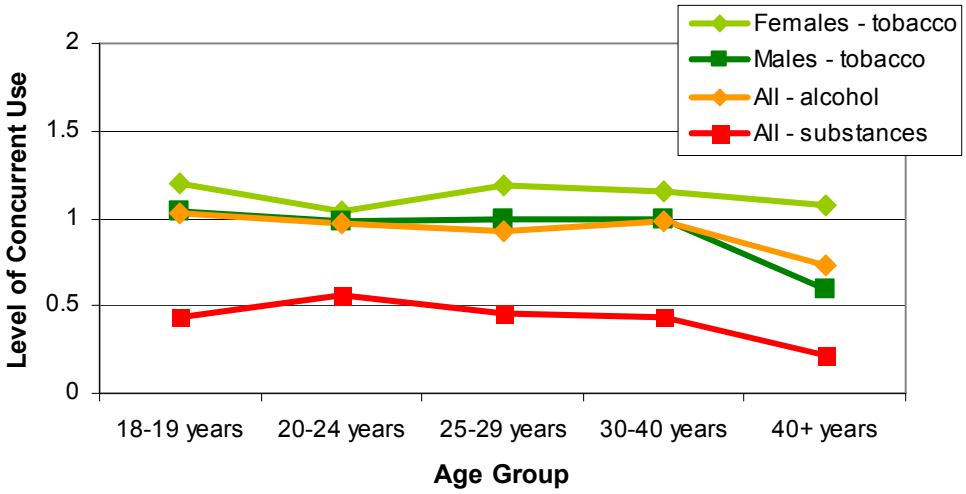

Figure 6.10. Concurrent use of tobacco, alcohol, and other substances by age and gender.

Problems Associated with Use

Participants who had used cannabis daily for a period of one month or more at any time in the past were asked about their experience of cannabis use-related problems during

that period of cannabis use. There were 655 participants who reported such use, encompassing 66% of all participants and 75% of those who had ever consumed a full cone or joint. As can be seen in Table 6.5, the cannabis-related problem reported most often by participants was problems with parents (29%), followed by financial problems (23%) and problems with their work or study (20%).

A cannabis problems variable was created through the direct summation of the eight questionnaire items (range: 0-8). This new variable was found to have good internal consistency reliability ($\alpha = 0.73$, $N = 796$) and was significantly positively correlated with proxy cannabis dependence ($r = .546$, $p < .001$, $N = 398$). The participants' mean cannabis problems score was 1.08 ($SD = 1.53$). A two-way ANOVA indicated no significant age, gender, or interaction effects (see Appendices G48 & G49).

Table 6.5

Participants Experiencing Cannabis Use-Related Problems

	Female		**Male**		**All**	
Type of Problem	*N*	%	*N*	%	*N*	%
Problems with parents	46	21.8 %	141	31.7 %	187	28.5 %
Financial problems	60	28.6 %	93	20.9 %	153	23.4 %
Problems with study/work	43	20.5 %	91	20.4 %	134	20.4 %
Problems with partner/spouse or boy/girlfriend	33	15.6 %	86	19.3 %	119	18.1 %
Legal problems	20	9.5 %	73	16.4 %	93	14.2 %
Psychological problems	40	19.0 %	51	11.5 %	91	13.9 %
Problems with friends	27	12.8 %	46	10.4 %	73	11.1 %
Health problems	28	13.3 %	41	9.2 %	69	10.5 %

Recent & Future Use

Recent Use

A total of 718 (73%) participants reported using cannabis within the previous 4 weeks. Cannabis had been most recently consumed on the day they took part in the study by 46% of participants, and by 26% on the previous day (see Table 6.6). Scoring these ten time categories from 1 = 'in the previous 4 weeks' to 10 = 'within the previous hour', the mean recent use score for the participants was 6.49 (*SD* = 2.83). A two-way ANOVA indicated that there was no significant difference between male and female participants in relation to how recently they had last consumed cannabis. Additionally, no age or interaction effects were indicated (see Appendices G50 & G51).

Table 6.6

Most Recent Cannabis Use by Participants Consuming Cannabis in the Previous 4 Weeks, by Gender

	Female		**Male**		**All**	
Most Recent Use	*N*	%	*N*	%	*N*	%
Day of Study						
Within the previous hour	58	25.8 %	117	23.7 %	175	24.4 %
1-2 hours previously	2	12.9 %	49	9.9 %	78	10.9 %
3-4 hours previously	12	5.3 %	26	5.3 %	38	5.3 %
5-7 hours previously	11	4.9 %	22	4.5 %	33	4.6 %
8+ hours previously	2	0.9 %	4	0.8 %	6	0.8 %
On the previous day	56	24.9 %	128	26.0 %	184	25.6 %
In the previous 2-3 days	23	10.2 %	55	11.2 %	78	10.9 %
In the previous week	17	7.6 %	49	9.9 %	66	9.2 %
In the previous 2-3 weeks	10	4.4 %	20	4.1 %	30	4.2 %
In the previous 4 weeks	7	3.1 %	23	4.7 %	30	4.2 %

Participants who had used cannabis in the past but reported no use in the previous 12 months (*N* = 85) and those who had used in the previous 12 months but not in the previous 4 weeks (*N* = 75) were asked their reasons for not using cannabis recently. These participants were also asked if they were likely to use cannabis again in the future. Responses to these two questions are presented in Table 6.7. Interestingly, half of the past cannabis-using participants who had not used cannabis in the previous 12 months indicated that they would not use cannabis again.

The main reason provided by participants for this decision was that they just did not want to use cannabis anymore. Participants indicating that they would use cannabis again were most likely to have not used in the previous 12 months because they did not have an opportunity to use (36%). This was also the main reason reported by participants who did not use cannabis in the previous 4 weeks but who expected to use cannabis in the future (44%). A total of 60% of participants who had not used in the previous 4 weeks stated that they would use cannabis in the future. The majority of the 7% of participants stating they would not use again had ceased use because they deemed that the bad effects of cannabis use outweighed any positive effects.

Table 6.7

Percentage of Participants Reporting Various Reasons for not Using Cannabis in the Previous 12 Months and 4 Weeks, by Likelihood of Future Use

	Likelihood of Future Use			**TOTAL**
	No	Maybe	Yes	**(reason for no use)**
Reason for no use in previous 12 months				
No opportunity	0.0 %	12.5 %	36.8 %	**11.8 %**
Just didn't want to use	57.1 %	54.2 %	10.5 %	**45.9 %**
Pregnancy/breastfeeding	2.4 %	0.0 %	0.0 %	**1.2 %**
Health problems	0.0 %	0.0 %	0.0 %	**0.0 %**
Legal issues	2.4 %	4.2 %	0.0 %	**2.4 %**
Too expensive	0.0 %	4.2 %	10.5 %	**3.4 %**
Bad effects outweighed good	11.9 %	12.5 %	10.5 %	**11.8 %**
Worry about health effects	4.8 %	0.0 %	0.0 %	**2.4 %**
Mental health problems	9.5 %	0.0 %	0.0 %	**4.7 %**
Wanting a healthier lifestyle	9.5 %	4.2 %	0.0 %	**5.9 %**
Pressured to stop	0.0 %	0.0 %	5.3 %	**1.2 %**
Other reason	2.4 %	8.3 %	26.3 %	**9.4 %**
TOTAL (likelihood future use)	**49.4 %**	**28.2 %**	**22.4 %**	**100.0 %**
Reason for no use in previous 4 weeks				
No opportunity	0.0 %	16.0 %	44.4 %	**32.0 %**
Just didn't want to use	20.0 %	72.0 %	26.7 %	**41.3 %**
Pregnancy/breastfeeding	0.0 %	0.0 %	0.0 %	**0.0 %**
Health problems	0.0 %	0.0 %	2.2 %	**1.3 %**
Legal issues	0.0 %	0.0 %	2.2 %	**1.3 %**
Too expensive	0.0 %	0.0 %	0.0 %	**0.0 %**
Bad effects outweighed good	60.0 %	8.0 %	2.2 %	**8.0 %**
Worry about health effects	20.0 %	0.0 %	0.0 %	**1.3 %**
Mental health problems	0.0 %	0.0 %	0.0 %	**0.0 %**
Wanting a healthier lifestyle	0.0 %	4.0 %	0.0 %	**1.3 %**
Pressured to stop	0.0 %	0.0 %	0.0 %	**0.0 %**
Other reason	0.0 %	0.0 %	22.2 %	**13.3 %**
TOTAL (likelihood future use)	**6.7 %**	**33.3 %**	**60.0 %**	**100.0 %**

Future Use

All participants (*N* = 989) were asked how much cannabis they though they would be using in 5 years time. The most common response was that they thought they would remain at their current level of use (38%), although 15% reported that they thought they would be using more cannabis (see Table 6.8).

Table 6.8

Expected Level of Future Cannabis Use as Compared to Current Level of Use, by Gender

	Female		**Male**		**All**	
Expected Level of Future Use	*N*	%	*N*	%	*N*	%
None	110	29.6 %	81	13.1 %	191	19.3 %
A lot less than now	51	13.7 %	67	10.9 %	118	11.9 %
A little less than now	51	13.7 %	105	17.0 %	156	15.8 %
Same amount as now	118	31.7 %	260	42.2 %	378	38.3 %
A little more than now	29	7.8 %	72	11.7 %	101	10.2 %
A lot more now	13	3.5 %	31	5.0 %	44	4.5 %

Summary & Discussion

Chapter Summary

This chapter provided a detailed examination of the participants' current patterns of cannabis use, thus addressing the second objective of the present study: to increase knowledge about, and understanding of, the nature of cannabis use.

Eighty percent of the participants (*N* = 795) in the present study had used cannabis in the 12 months prior to taking part in the study. Approximately half of these recent users had consumed cannabis in the week before participating, while about a third had most recently used cannabis in the previous 4 weeks. Just over a third of recent users reported

using cannabis on a daily basis in the previous 12 months, and a quarter had used on most days. However 52% of recent users (n = 412) reported using cannabis everyday in the week prior to completing the questionnaire.

Thus, it appears that the participants who described their frequency of use as being 'most days' (n = 194) were perhaps (unintentionally?) misrepresenting their actual frequency use, or maybe usage patterns for the previous 4 weeks were not indicative of the patterns for the whole previous 12 months. However, due to the nature of the questioning in the study, items asking about use in the previous week or month are probably more likely to be accurate than data based on participants having to estimate over a whole year. It is also worth noting that asking participants to report for a 'typical' week may lead to a different process of estimation and, thus, some level of inaccuracy (e.g., a participant may use on three out of four Mondays) than the more tangible 'in the last week'.

There was a large amount of diversity evident in the participants' current pattern of cannabis use. For example, while participants consumed approximately 16 cones/joints per week, the range of consumption was substantial (0-301). However, to provide an overview, the most commonly reported patterns of use are summarised here. Participants were most likely to consume the heads of the cannabis plant, and tended to use both hydroponic and naturally grown cannabis. They were most likely to smoke joints, which typically did not have tobacco added as spin, and were unlikely to use alcohol, tobacco or other substances concurrently. Participants typically used cannabis at night, in their own home, and with friends; normally getting a little stoned or high. On average, participants reported experiencing one cannabis use-related problem, which was most typically in relation to problems with their parents. Yet, participants were also most likely to report that they expected to be using the same amount of cannabis in five years time.

A large age effect was indicated for normal level of intoxication, with older participants experiencing lower levels of intoxication than younger participants. The same

pattern was evident in relation to highest levels of intoxication, although the age effect in this instance was medium-sized. A medium age effect was also indicated for peer cannabis use, with older participants tending to have fewer cannabis-using friends than younger participants. While, small age and gender differences were indicated for a number of the variables, with females tending to have fewer cannabis-using friends and being more likely to use tobacco and cannabis concurrently than males, and older participants being more likely to engage in solitary use and being less likely to use alcohol and other substances concurrently with cannabis than younger participants.

Comparison Data

Rate of Use, Quantity, & Quality

In comparison to population levels of lifetime cannabis use, the participants in the current study were more likely to have used cannabis than the rate reported for the general populations in Australia, the USA and the UK (see Table 6.9). For example, a much greater proportion of study participants had used cannabis in the week or month prior to being surveyed. The participants were also over 3 times more likely to be daily or near daily cannabis users than members of the general population in Australia or the USA.

With approximately half of the recent users in the present study reporting daily cannabis use, this sample is similar to the Australian samples of long-term regular urban and rural cannabis users. Sixty percent of Reilly, Didcott, Swift, and Hall's (1998) rural sample and 56% of Swift, Hall, and Copeland's (1998) urban sample were daily cannabis users, with a further 26% and 18%, respectively, using cannabis on most days of the week. In terms of actual cannabis consumption, the present sample consumed a median of 15.5 cones/joints per week (range: 0-301) or 2.2 cones/joints per day (range: 0-43). Similarly, the rural sample consumed a median of 2 joints per day (range: 0.2-40), while the urban sample consumed a median of 6 cones per day (0.1-50) and, higher again, was the consumption level of

Copeland, Swift, and Rees' (2001) treatment sample, with a median of 8 cones per day (range: 0.1-125). Interestingly, the consumption level of the present sample fell between that of Looby and Earleywine's (2007) dependent (*M* = 16.58 joints per week, *SD* = 15.18) and non-dependent (*M* = 14.14, *SD* = 13.61) users.

Table 6.9

Comparison of Cannabis Use by Participants with the Population Levels of use in Australia, the UK, and the USA

	This Study	Australia [a]	USA [b]	UK [c]
Most Recent Use				
In last week	42.4 %	4.6 %	-	-
In last month	30.4 %	6.7 %	6.0 %	6.5 %
In last 12 months	7.8 %	11.3 %	10.4 %	10.8 %
				-
Daily (or near daily) use	60.4 % *	16.4 % *	13.3 % *	

[a] 2004 National Drug Strategy Household Survey (AIHW, 2005)
[b] 2005 National Survey on Drug Use and Health (SAMHSA, 2006))
[c] 2005 National Report to the EMCDDA (UK Focal Point on Drugs, 2005)
* Based on percentage of individuals using cannabis in the previous 12 months.

The primary preference for consuming the heads of the cannabis plant was evident across research samples: 67% of the present sample, 57% of the rural sample, 93% of the urban sample, and 93% of the treatment sample. However, while the most commonly endorsed method of administration for the present and the rural samples was smoking joints (36% and 70%, respectively), the urban and treatment samples were more likely to use bongs (83% and 74%, respectively) (Copeland et al., 2001; Reilly et al., 1998; Swift, Hall, & Copeland, 1998).

The participants' tendency to predominantly use cannabis in the evening (62%) or night (53%), with few using in the morning (9%), was consistent with usage patterns

reported for the treatment (54% evening or night, 10% morning) and urban (41% evening, 47% night, 11% morning) samples (Copeland et al., 2001; Swift, Hall, & Copeland, 1998)

Context of Use

The physical and social context of cannabis use tended to differ between research samples. Participants in the present study and the urban sample assessed by Swift, Hall, and Copeland (1998) were most likely to use cannabis with friends (52% and 83%, respectively), with fewer participants primarily using alone (43% and 39%, respectively). This was in contrast to the participants in the treatment sample, who were most likely to use alone (80%). However, all three samples were most likely to use cannabis in their own home: 74% of the present sample and 93% of both the urban and treatment samples.

Problems Associated with Use

As can be seen in Table 6.10, the participants in the present sample were less likely than Swift et al.'s (1998; 2000) urban sample to experience cannabis use-related legal or health problems-related problems, but were slightly more likely to have financial problems.

Table 6.10

Comparison of Problems Associated with Cannabis Use reported by the Participants with Relevant Data from Other Research Sample Populations

	This Study	**Urban** [a]	**Rural** [b]	**Treatment** [c]
Financial problems	23 %	21 %		62 %
Legal problems	14 %	21 %	26 %	18 %
Problems with friends	11 %	-	-	54 %
Any physical/health problems	47 %	52 %	47 %	-
Health problems	11 %	-	-	83 %
Psychological problems	14 %	-	-	31 %

[a] Swift, Hall, and Copeland (1998), Swift et al. (2000)
[b] Reilly et al. (1998), Swift, Hall, Didcott et al. (1998)
[c] Copeland et al. (2001)

In comparison to the rural sample (Reilly et al., 1998; Swift, Hall, Didcott et al., 1998), the present sample was less likely to have experienced legal problems and equally likely to have health problems. In contrast, every cannabis use-related problem was reported by a higher (often substantially so) proportion of Copeland et al.'s (2001) treatment sample than by the present sample.

Conclusions

These results indicate that the present sample does not differ greatly, in relation to the aspects of cannabis use for which comparison data was available, from previous research samples of non-treatment-seeking cannabis users. However, the present sample did differ from Copeland et al.'s (2001) treatment sample in a number of ways. For example, the treatment sample consumed four times more cones/joints on average than the present sample, were predominantly bong users, and the vast majority used cannabis alone. Further, participants in the treatment sample were much more likely to report experiencing cannabis use-related problems than the participants in the present study. Thus, these findings reinforce those from Chapters 3, 4 and 5, where it was evident that the participants in the present study sample differ from both treatment-seeking cannabis users and members of the general population, and share a number of similarities with prior samples of non-treatment-seeking cannabis users.

Study participants displayed a high level of similarity in relation to some aspects of use, such as their weekly usage patterns and the characteristics of the cannabis they consumed. This information is pertinent in relation to the development of appropriately informed health education and harm minimisation campaigns. For example, knowing that the majority of cannabis users do not exercise a preference regarding the method of cultivation of the cannabis they consume, it would be unwise to expend public health dollars on advertising campaigns that are based on the assumption that users prefer hydroponic

cannabis. However, to design effective preventative campaigns and early intervention strategies it is first necessary to have a clear understanding of what motivates individuals to use cannabis, and what it is about the effects of cannabis that leads to continued use. These issues will be explored in the Chapter 8.

Nevertheless, in assessing current cannabis use in more depth than is typical of past studies, the findings of the present study indicate the existence of a high level of diversity in the patterns of cannabis use and use-related behaviours in the hidden population of cannabis users. Acknowledgement of this heterogeneity is essential if clinicians and researchers are to be able to design appropriately targeted treatment strategies for cannabis users. For example, while participants were most likely to use cannabis socially, a substantial proportion primarily used cannabis on their own, suggesting the need for different strategies (i.e., refusal skills would perhaps be beneficial for social users, while delaying strategies would be more appropriate for solitary users). It is possible that these differences in patterns of cannabis use are implicated in the different outcomes of use evident in society. This premise will be assessed in relation to cannabis dependence (in Chapter 7), and everyday psychological and cognitive functioning (in Chapters 9 and 10, respectively).

Patterns of Use Variables

A large number of variables were described in this Chapter. Those that are utilised in future chapter are displayed in Table 6.11, while the descriptive statistics for these variables are provided in Appendix G52.

Table 6.11

Patterns of Cannabis Use Variables

	Scoring Range	Score Interpretation
Rate of Use, Quantity & Quality Variables		
Frequency of use	1 – 5	Higher score = greater frequency of use Where: 1 = less than monthly use, 2 = monthly use, 3 = weekly use, 4 = use on most days, 5 = daily use
Number of days used in typical week	0 - 7	Higher score = greater of number of days/week of which cannabis was used
Weekly cones/joints group	1 - 11	Higher score = greater number of cones/joints consumed per week Where: 1 = 1-2 cones/joints per week, 2 = 3-4, 3 = 4-9, 4 = 10-14, 5 = 15-19, 6 = 20-29, 7 = 30-49, 8 = 50-74, 9 = 75-99, 10 = 100-149, 11 = 150 or more cones/joints per week
Cannabis potency	4 – 24	Higher score = more potent cannabis
Proportion of cannabis in cones/joints	0.13 – 1.00	Higher score = higher proportion of cannabis in cones/joints consumed Where: 0.13 = 13% cannabis, 87% tobacco; 1.00 = 100% cannabis, 0% tobacco
Strength of cones/joints	1 – 24	Higher scores = stronger cones/joints Calculation: potency x proportion of cannabis
Daily dose group	1 – 11	Higher score = higher cannabis dose consumed per day Calculation: strength of cones/joints x weekly cones/joints, divided by 7 days

Table 6.11 continued

	Scoring Range	Score Interpretation
Normal level of intoxication	0 – 5	Higher score = higher normal level of intoxication Where: 0 = 'not affected', 1 = 'relaxed', 2 = 'uninhibited', 3 = 'a little stoned/high', 4 = 'moderately stoned/high', 5 = 'very stoned/high'
Highest level of intoxication	0 – 5	Higher score = higher highest level of intoxication Where: 0 = 'not affected', 1 = 'relaxed', 2 = 'uninhibited', 3 = 'a little stoned/high', 4 = 'moderately stoned/high', 5 = 'very stoned/high'
Context of Use Variables		
Concurrent tobacco use	1 – 2	0 = 'never', 1 = 'sometimes', 2 = 'mostly/always
Concurrent alcohol use	1 – 2	0 = 'never', 1 = 'sometimes', 2 = 'mostly/always
Concurrent substance use	1 – 2	0 = 'never', 1 = 'sometimes', 2 = 'mostly/always
Solitary use	0 – 4	0 = 'never', 1 = 'rarely', 2 = 'sometimes', 3 = 'mostly', 4 = 'always'
Peer cannabis use	0 – 4	Higher = more cannabis-using friend Where: 0 = 'none'; 1 = 'a few'; 2 = 'many', 3 = 'most'; 4 = 'all'
Cannabis use-related problems (α = 0.73)	0 – 8	Higher score = more cannabis use-related problems experienced
Most recent use	1 – 10	Higher score = more recent use of cannabis Where: 1 = in the previous 4 weeks, 10 = in the previous hour

CHAPTER 7

HEAVY, PROLONGED, & DEPENDENT USE

Introduction

The second objective of the present study is to increase knowledge about, and understanding of, the nature of cannabis use. The present chapter, examining heavy, prolonged and dependent use, focuses on three important aspects of cannabis use: peak level of use, duration of use, and proxy dependence. It is believed that examination of these aspects of cannabis use will reveal the presence of heterogeneity in the present sample. To test this hypothesis, each of the three key aspects of cannabis use have been explored descriptively, and examined in relation to age and gender effects.

As discussed in previous chapters, many current and childhood factors are reportedly associated with cannabis use. To reiterate, cannabis use has been associated in the literature with: younger age (e.g., Roeloffs, Wells, Ziedonis, Tang, & Unutzer, 2002); male gender (e.g., Coffey, Carlin, Lynskey, Li, & Patton, 2003); less education (e.g., Fergusson, Horwood, & Beautrais, 2003); tobacco use (e.g., Rey, Sawyer, Raphael, Patton, & Lynskey, 2002); high level alcohol use (e.g., McGee, Williams, Poulton, & Moffitt, 2000); use of other illicit drugs (e.g., Fergusson, Horwood, & Swain-Campbell, 2002); antisocial/delinquent behaviour (e.g., Coffey, Lynskey, Wolfe, & Patton, 2000); psychopathology (e.g., Lynskey et al., 2002); high sensation-seeking personality traits (e.g., Palmgreen, Donohew, Lorch, Hoyle, & Stephenson, 2001); having friends who use cannabis (e.g., Coffey et al., 2000); low levels of parental attachment during adolescence (e.g., McGee et al., 2000); family history of cannabis or other substance use (e.g., Hopfer, Stallings, Hewitt, & Crowley, 2003); exposure to parental conflict (e.g., Lynskey et al., 2002); low socioeconomic status during childhood (e.g., McGee et al., 2000); and, coming from a single-parent family (e.g., Rey et al., 2002). Cannabis dependence

has also been reported to be associated with: early age at initiation of cannabis use (e.g., Swift, Hall, Didcott, & Reilly, 1998); being single (e.g., Teesson, Hall, Lynskey, & Degenhardt, 2000); being unemployed (e.g., Teesson et al., 2000); having a history of sexual abuse (e.g., Lynskey et al., 2002).

Although many of these factors were not found to be associated with the initiation of cannabis use (in Chapter 5) they may be associated with other patterns of cannabis use. If these variables are indeed risk factors for the patterns of use investigated in the present chapter, we would expect those individuals with more exposure to these risk factors will: (1) exhibit higher levels of peak cannabis use, (2) have used cannabis for a longer period of time, and (3) be more likely to meet proxy dependence criteria, than individuals with less exposure. To test these hypotheses, a series of stepwise multiple regressions were completed with each of the three key aspects of cannabis use as dependent variables.

Thus, in the present chapter, the investigation initially focuses on the participants' heavy, prolonged, and dependent use of cannabis, with second section of the chapter exploring the associations between these key aspects of use and current and childhood lifestyle factors. The final section of the present chapter provides a summary of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample in context, both in relation to cannabis-using populations and the general population.

Key Aspects of Cannabis Use

Peak Level of Use

A total of 945 (96%) participants had tried cannabis at least once. This consisted of 345 (93%) of the female and 600 (97%) of the male participants. Of those who had tried cannabis, 7% had never consumed a full cone or joint by themselves (i.e., had only ever

shared a cone or joint with other people). Twelve percent of participants described their highest level of cannabis use as occasional or social use, which were defined as using "sometimes when it is available, but not often" and "moderate amounts (not enough to get very stoned/high) in social situations", respectively. Binge use was defined as using "large amounts of cannabis (gets very stoned/high) in each session, with infrequent sessions (two or three times a week at most)". This description was nominated by 10% of participants as representing their peak level of cannabis use. Daily or near daily use was reported as the highest level of use by 67% of participants. These categories were defined by the number of cones/joints smoked on most or all days of the week, as follows: light, 1-3 cones/joints; moderate, 4-9; heavy, 10-20; very heavy, more than 20 cones/joints (see Figure 7.1 and Appendix H1).

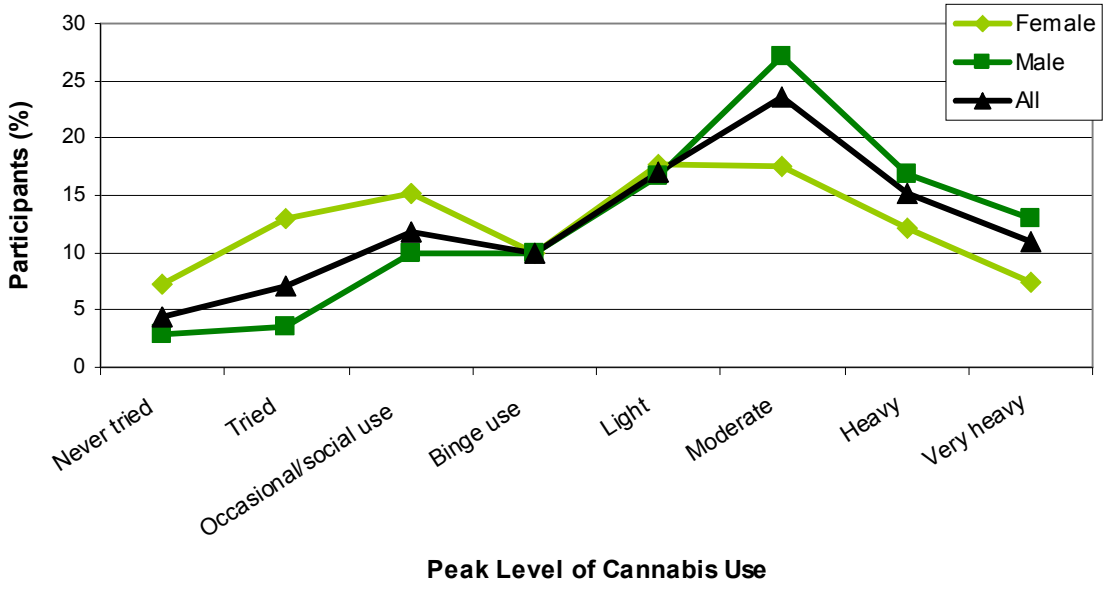

Figure 7.1. Distribution of participants by peak level of cannabis use and gender

The peak cannabis use categories were assigned scores from 1-8, where higher scores equated to heavier cannabis use. Thus all 989 study participants were assigned a peak cannabis use score, with the mean score being 3.51 (*SD* = 0.81). A two-way ANOVA

indicated a medium gender effect, with males (M = 3.65, SD = 0.68) reporting significantly higher levels of peak cannabis use than females (M = 3.27, SD = 0.95): $F(1, 988) = 46.87$, $p < .001$, $\eta^2 = .045$. This gender difference was evident at both ends of the peak use spectrum. At the lower levels of use, 20% of females had either never used cannabis or had not consumed a full cone/joint in comparison to only 6% of males. Additionally, daily or near daily use was reported as the highest level of cannabis use by nearly three-quarters (74%) of males, but only just over half (55%) of the females. Interestingly, 10% of both males and females reported binge use as their peak level of cannabis use. No age or interaction effects were indicated (see Appendices H2 & H3).

Duration of Use

Duration of cannabis use was calculated by subtracting age at first use from current age for recent users, and from age at cessation of use for ex-users. The 114 (75 females, 39 males) participants who had not consumed a full cone or joint were excluded from the following analyses. The mean duration of use for participants was 13.5 years (SD = 11.20, range = <1 year - 58 years), with less than 1% of participants using cannabis for less than a year, and 2% using for more than 40 years. The most common duration of use was 5-7 years, which was reported by 20% of participants (see Figure 7.2 & Appendix H4).

Unsurprisingly, a one-way ANOVA indicated a large age effect, with older participants reporting significantly longer durations of cannabis use than younger participants: $F(4, 866) = 689.32$, $p < .001$, $\eta^2 = .763$. As is evident in Figure 7.3, there were no significant gender or interaction effects (see Appendices H4-H7).

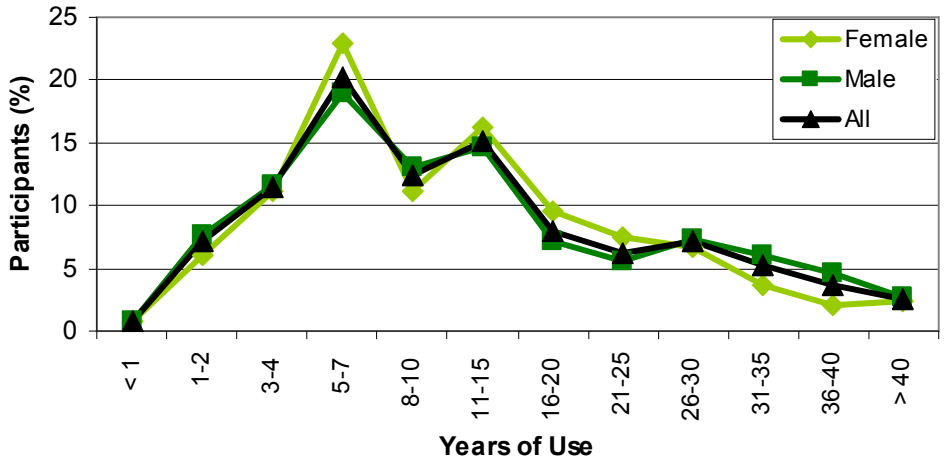

Figure 7.2. Distribution of participants by duration of cannabis use and gender

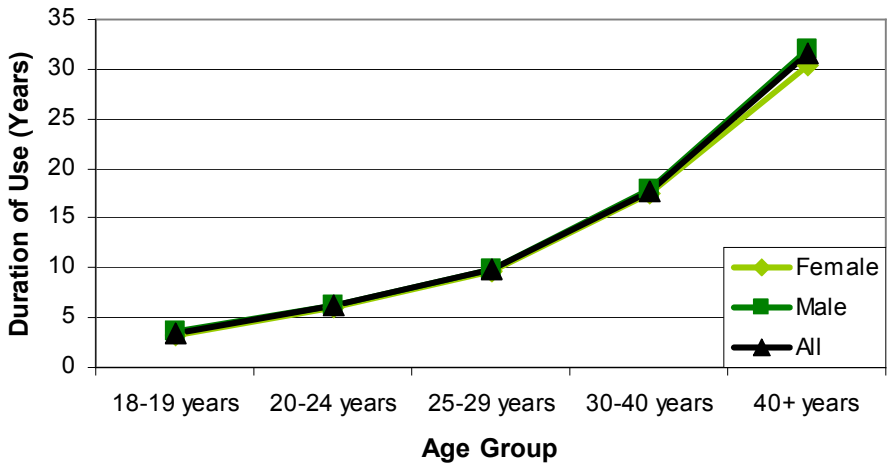

Figure 7.3. Duration of cannabis use by age group and gender

Proxy Cannabis Dependence

The 412 participants (141 females, 271 males) who reported using cannabis everyday in the previous week were assessed for proxy dependence and abuse diagnoses. Diagnostic orphans were also identified; that is, those individuals who did not meet criteria for a proxy

diagnosis of either abuse or dependence, but did meet criteria for one or two of the dependence items. The questionnaire items that comprised the proxy measure of cannabis dependence and abuse were based on the relevant DSM-IV criteria. Overall, 32% of the participants assessed met proxy criteria for a diagnosis of cannabis dependence. A further 28% met proxy criteria for a diagnosis of cannabis abuse, while 28% were classified as diagnostic orphans. The remaining 13% of the daily cannabis users did not endorse any of the questionnaire items assessing proxy dependence or abuse (see Figure 7.4 and Appendix H8).

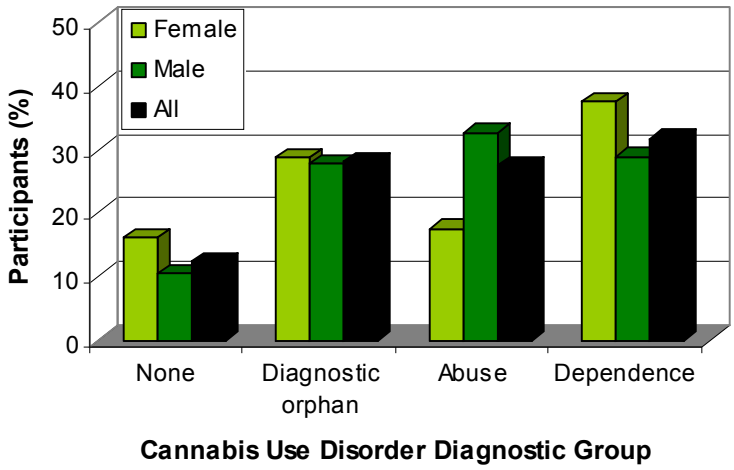

Figure 7.4. Proxy cannabis use diagnoses by gender

The participants' mean proxy dependence score ('dependent' = 1, 'not dependent' = 0) was 0.32 (*SD* = 0.47). A two-way ANOVA indicated a medium age effect ($F[4, 398] = 3.65$, $p = .006$, $\eta^2 = .036$), however no gender, or interaction effects were indicated (see Appendices H9 & H10). A post hoc Tukey's HSD analysis indicated that the participants who were aged over forty years of age (*M* = 0.16, *SD* = 0.37) were significantly less likely to meet proxy cannabis dependence than participants aged in their teens (*M* = 0.41, *SD* = 0.50) and early twenties (*M* = 0.40, *SD* = 0.49) (see Figure 7.5 and Appendix H11).

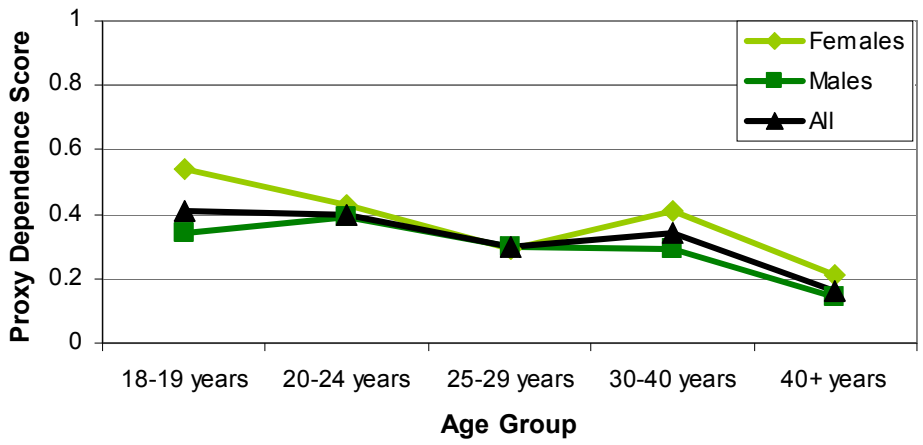

Figure 7.5. Proxy cannabis dependence by gender and age group

However, to gain a clearer perspective, the number of proxy dependence criteria met by participants was also examined. For this variable, all participants who had used cannabis in the 12 months prior to survey completion where included, with those who had not used cannabis in everyday in the previous week receiving a score of 0. Thus the number of proxy dependence criteria could range from 0-7 (see Figure 7.6 and Appendix H12). Using this procedure the mean number of criteria met by the participants was 1.03 (*SD* = 1.52). A two-way ANOVA indicated that there were no age, gender, or interaction effects for this variable (see Appendices H13 & H14).

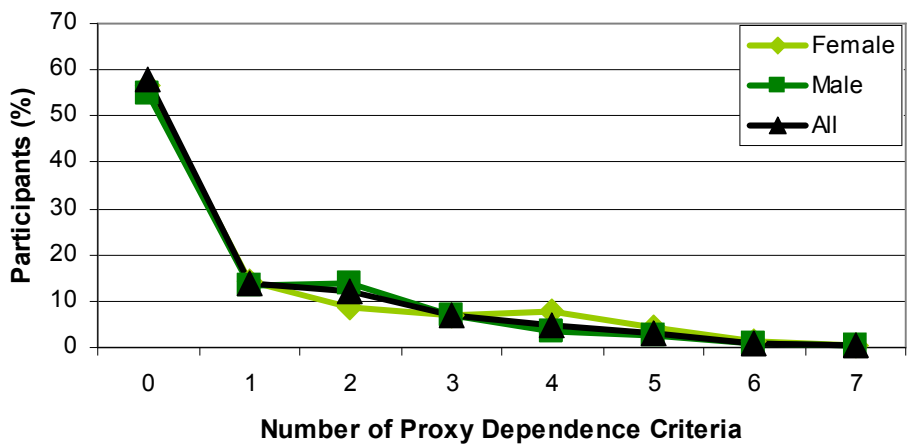

Figure 7.6. Number of proxy cannabis dependence met by gender

Factors Associated with Key Aspects of Cannabis Use

To further understand the participants' differing cannabis use outcomes preliminary correlation analyses were undertaken to determine the associations between childhood and current lifestyle factors and the three key aspects of cannabis use examined in the present Chapter (see Appendix H15). Variables found to be significantly associated with these cannabis use outcomes were then entered into stepwise multiple regression analyses. For peak cannabis use and duration of use, three multiple regression analyses were completed; one each for childhood lifestyle factors and current lifestyle factors, with the final multiple regression containing the variables that were significantly indicated in the prior analyses as being associated with peak cannabis use. An additional multiple regression analysis was completed for proxy dependence criteria to allow investigation of the role played by cannabis use factors.

Peak Cannabis Use

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and peak cannabis use, included seven variables: gender, unemployment, highest level of education, peer cannabis use, frequency of tobacco use, poly-substance use, and sensation seeking. Five of these variables (gender, unemployment status, peer cannabis use, frequency of tobacco consumption, and poly-substance use) were retained in the final regression model, explaining 31% of the variance in peak cannabis use scores: $F(5, 988) = 90.98$, $p < .001$ (see Table 7.1 and Appendix H16).

The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included six variables: family addiction problems, delinquent behaviour, running away from home, and early use of alcohol, tobacco and other substance. Three of these variables (delinquent behaviour and early tobacco and substance use) were

retained in the final regression model, explaining 9% of the variance in peak cannabis use scores: $F(3, 986) = 34.76$, $p < .001$ (see Table 7.1 and Appendix H16).

Table 7.1

Multiple Regression on Peak Cannabis Use Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* $R^2 = .313$)						
Peer cannabis use	0.56	0.05	0.32	11.80	<.001	.097
Poly-substance use	0.36	0.05	0.21	7.70	<.001	.052
Current tobacco use	0.20	0.02	0.23	8.70	<.001	.041
Gender	0.72	0.11	0.18	6.76	<.001	.032
Unemployment	0.50	0.14	0.09	3.45	.001	.008
Childhood Lifestyle Factors (*Adj.* $R^2 = .093$)						
Delinquent behaviour	0.07	0.01	0.22	6.72	<.001	.042
Early substance use	0.61	0.19	0.10	3.31	.001	.010
Early tobacco use	0.43	0.13	0.11	3.29	.001	.010
Final Regression Model (*Adj.* $R^2 = .325$)						
Peer cannabis use	0.55	0.05	0.31	11.52	<.001	.091
Current tobacco use	0.17	0.02	0.20	7.21	<.001	.035
Gender	0.72	0.11	0.18	6.82	<.001	.032
Poly-substance use	0.31	0.05	0.18	6.41	<.001	.028
Unemployment	0.47	0.14	0.09	3.29	.001	.007
Delinquent behaviour	0.02	0.01	0.08	2.73	.006	.005
Early tobacco use	0.33	0.12	0.08	2.84	.005	.005

The final stepwise multiple regression analysis contained all eight of the variables identified through the previous analyses as being significantly associated with peak cannabis use scores. Thus the analysis included five current lifestyle factors (gender, employment

status, peer cannabis use, frequency of tobacco consumption, and poly-substance use) and three childhood lifestyle factors (delinquent behaviour and early tobacco and substance use). Seven of these variables (all except early substance use) were retained in the final regression model, explaining 33% of the variance in peak cannabis use scores: $F(7, 988) = 72.19$, $p < .001$ (see Table 7.1 and Appendix H16). Thus, peak cannabis use was primarily associated with having cannabis-using friends, frequent tobacco and poly-substance consumption, and male gender. Unemployment, childhood delinquent behaviour, and early tobacco use were also weakly associated with peak use.

Duration of Use

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and duration of cannabis use, included 11 variables: age group, single marital status, proxy SES, unemployment, highest level of education, peer cannabis use, frequency of alcohol use, poly-substance use, sensation seeking, and health problems. Three of these variables (age group, peer cannabis use, and poly-substance use) were retained in the final regression model, explaining 55% of the variance in duration of cannabis use: $F(3, 988) = 400.58$, $p < .001$ (see Table 7.2 and Appendix H16).

The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included eight variables: proxy SES, death of someone close, lack of adult support, early alcohol and substance use, delinquent behaviour, running away from home, and psychopathology. Five of these variables (delinquent behaviour, psychopathology, proxy SES, and early use of alcohol and other substances) were retained in the final regression model, explaining 11% of the variance in duration of cannabis use: $F(5, 980) = 23.88$, $p < .001$ (see Table 7.2 and Appendix H16).

The final stepwise multiple regression analysis contained all eight of the variables identified through the previous analyses as being significantly associated with duration of

cannabis use. Thus the analysis included three current lifestyle factors (age group, peer cannabis use, and poly-substance use) and five childhood lifestyle factors (proxy SES, delinquent behaviour, psychopathology and early alcohol and substance use). Six of these variables (all except childhood psychopathology and proxy SES [parental]) were retained in the final regression model, explaining 58% of the variance in duration of cannabis use: $F(6, 980) = 229.13$, $p < .001$ (see Table 7.2 and Appendix H16).

Table 7.2

Multiple Regression on Duration of Cannabis Use

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* $R^2 = .548$)						
Age group	1.21	0.04	0.70	31.73	<.001	.461
Peer cannabis use	0.48	0.05	0.22	9.99	<.001	.046
Poly-substance use	0.34	0.05	0.16	7.25	<.001	.024
Childhood Lifestyle Factors (*Adj.* $R^2 = .105$)						
Early substance use	1.16	0.23	0.16	5.11	<.001	.024
Delinquent behaviour	0.06	0.01	0.15	4.71	<.001	.020
Childhood psychopathology	- 0.31	0.07	- 0.13	- 4.27	<.001	.017
Early alcohol use	0.56	0.15	0.12	3.84	<.001	.013
Proxy SES (parental)	0.12	0.03	0.10	3.43	.001	.011
Final Regression Model (*Adj.* $R^2 = .583$)						
Age group	1.21	0.04	0.70	32.70	<.001	.459
Peer cannabis use	0.45	0.05	0.21	9.69	<.001	.040
Delinquent behaviour	0.04	0.01	0.11	4.75	<.001	.010
Poly-substance use	0.22	0.05	0.10	4.37	<.001	.008
Early alcohol use	0.45	0.10	0.09	4.44	<.001	.008
Early substance use	0.60	0.16	0.08	3.80	<.001	.006

Thus, unsurprisingly, duration of cannabis use was primarily explained by current age. Having cannabis-using friends was also associated with increased durations of use, while having engaged in delinquent behaviour during childhood/adolescence, current poly-substances use, and early use of alcohol and other substances were all weakly associated with duration of use.

Number of Proxy Dependence Criteria

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and the number of proxy dependence criteria met by the participants, included four variables: highest level of education, frequency of tobacco use, and sleep and health problems. Two of these variables (tobacco use and sleep problems) were retained in the final regression model, explaining 8% of the variance in the number of proxy dependence criteria met: $F(2, 776) = 33.75, p < .001$ (see Table 7.3 and Appendix H16).

The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included eight variables: sole parent family, family addiction problems, sexual abuse, delinquent behaviour, running away from home, and early use of alcohol, tobacco and other substances. Only one of these variables, delinquent behaviour, was retained in the final regression model, explaining 6% of the variance in the number of proxy dependence criteria met: $F(1, 743) = 47.50$ $p < .001$ (see Table 7.3 and Appendix H18). The third stepwise multiple regression analysis, investigating associations with cannabis use factors, included thirteen variables: age at initiation of cannabis use, peak level of use, frequency of use, weekly number of cones/joints, proportion of cannabis in cones/joints, strength of cones/joints, daily dose group, normal and highest levels of intoxication, solitary use, and concurrent use of alcohol, tobacco and other substances. Six of these variables (frequency of use, weekly number of cones/joints, daily dose group, normal level of intoxication, solitary use, and concurrent substance use) were retained in the final regression

model, explaining 33% of the variance in the number of proxy dependence criteria met by participants: $F(6, 718) = 60.65$, $p < .001$ (see Table 7.3 and Appendix H16).

Table 7.3

Multiple Regression on Number of Proxy Dependence Criteria Met by Participants

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* $R^2 = .078$)						
Current tobacco use	0.17	0.02	0.24	6.82	<.001	.055
Self-identified sleep problems	0.22	0.06	0.13	3.87	<.001	.018
Childhood Lifestyle Factors (*Adj.* $R^2 = .059$)						
Delinquent behaviour	0.06	0.01	0.25	6.89	<.001	.060
Cannabis Use Factors (*Adj.* $R^2 = .333$)						
Weekly number of cones/joints	0.35	0.05	0.59	7.25	<.001	.049
Frequency of use	0.23	0.05	0.20	4.46	<.001	.018
Daily dose group	- 0.20	0.05	- 0.34	- 4.38	<.001	.018
Solitary use	0.20	0.05	0.14	4.31	<.001	.017
Concurrent substance use	0.34	0.09	0.12	3.94	<.001	.014
Normal level of intoxication	0.16	0.04	0.12	3.79	<.001	.013
Final Regression Model (*Adj.* $R^2 = .347$)						
Weekly number of cones/joints	0.34	0.05	0.58	7.21	<.001	.047
Daily dose group	- 0.21	0.05	- 0.36	- 4.67	<.001	.020
Frequency of use	0.23	0.05	0.20	4.65	<.001	.019
Solitary use	0.19	0.05	0.14	4.14	<.001	.015
Delinquent behaviour	0.03	0.01	0.12	4.02	<.001	.014
Normal level of intoxication	0.16	0.04	0.12	3.88	<.001	.013
Concurrent substance use	0.29	0.08	0.11	3.51	<.001	.011

The final stepwise multiple regression analysis contained all nine of the variables identified through the previous analyses as being significantly associated with the number of proxy dependence criteria met by participants. Thus the analysis included two current lifestyle factors (sleep problems and frequency of tobacco consumption), one childhood lifestyle factors (delinquent behaviour), and six cannabis use factors (frequency of use, weekly number of cones/joints, daily dose group, normal level of intoxication, concurrent substance use, and solitary use). Seven of these variables (all except current tobacco use and sleep problems) were retained in the final regression model, explaining 35% of the variance in the number of proxy dependence criteria met by the participants: $F(7, 729) = 56.33$, $p < .001$ (see Table 7.3 and Appendix H16). Thus, the number of proxy dependence criteria endorsed by the participants was primarily associated with the number of cones/joints they typically consumed in a week. Daily dose group (negative association), frequency of use, solitary use, delinquent behaviour, normal level of intoxication, and concurrent substance use were also associated with the number of dependence criteria endorsed by the participants.

Summary & Discussion

Chapter Summary

This chapter provided a detailed examination of heavy, prolonged and dependent cannabis use in the present sample, thus addressing the second objective of the present study: to increase knowledge about, and understanding of, the nature of cannabis use.

While the majority of participants had used cannabis daily or near daily, males were more likely than females to have used cannabis heavily, and peak level of use ranged from never having tried cannabis through to the consumption of more than 20 cones/joints per day. The participants in the present study had used cannabis for durations between less than 12 months to 58 years, with a mean duration of 13 years of use. A total of 32% of the

present study's daily cannabis using participants met proxy dependence criteria, while 28% met proxy criteria for a diagnosis of cannabis abuse, and 28% were classified as diagnostic orphans. Thus, only 13% of the daily cannabis users in the present study did not endorse any of the proxy dependence criteria

The present findings suggest that the key indicators of peak cannabis use are peer use, current tobacco and poly-substance use, male gender, being unemployed, using tobacco before the age of 16 years, and engaging delinquent behaviour during childhood/ adolescence. Together, these factors explained a 33% of the variance in the participants' peak cannabis use scores. With cannabis use by friends the variable most strongly associated with peak levels of cannabis use, the importance of interpersonal factors is apparent. Furthermore, the individual factors implicated in peak cannabis use indicate the importance of the drug using culture. That is, poly-substance use and current tobacco use were key indicators, while the use of tobacco before the age of 16 years was also significantly related to peak cannabis use. It is possible that individuals who engage in poly-substance use and have substance user friends, are influenced by the apparent normalisation of such substance use in their social circles. Moreover, for the individuals who were exposed to addiction problems in the family home (a key factor associated with delinquent behaviour; discussed in Chapter 4) such substance use may appear to be a normal way of life.

Duration of cannabis use was primarily related to current age, but current poly-substance use, peer cannabis use, delinquent behaviour, and the use of alcohol and other substances before the age of 16 years, were also associated. These variables explained 58% of the variance in the duration of the participants' cannabis use. The substantial age effect was unsurprising: the older participants have simply had more years in which to use cannabis than the younger participants. However, interestingly, the association between duration of use and age at initiation of use was not significant.

The significant associations with poly-substance use and use of cannabis by friends parallel the findings for peak use, suggesting that individuals are more likely to prolong their use of cannabis if it is normalised within their social life and part of a wider pattern of substance use. Additionally, the association between duration of use and early alcohol and substance use suggests that the participants' cannabis use may be just one aspect of a long-standing pattern of substance use. Further, with delinquent behaviour again implicated, the importance of childhood/adolescent externalising behaviour is highlighted.

The number of cones/joints consumed per week was the primary indicator of the number of proxy dependence criteria that were endorsed by the participants. Other key indicators were the frequency of cannabis use, how often participants used cannabis on their own, daily dose, normal level of intoxication, concurrent substance use, and having engaged in delinquent behaviour during childhood/adolescence. Overall, these variables explained 35% of the variance in the number of proxy dependence criteria that were endorsed by the participants in the present study.

Interestingly, the association between daily dose and number of proxy dependence criteria indicated in the relevant multiple regression analysis was negative; the two variables are positively correlated. This result implies that, in this context, lower daily doses were associated with higher levels of dependence. This would appear to be illogical. However, on examining the associations between number of proxy dependence criteria and the cannabis use variables utilised in the calculation of daily dose, it was apparent that there was a significant negative correlation with the proportion of cannabis in the cones/joints consumed by the participants (and also the associated strength of cones/joints variable). Thus, indicating that participants who used more 'spin' in their cones/joints endorsed more of the proxy dependence criteria than those who added little or no tobacco to their cannabis. This finding is consistent with recent research by Ream, Benoit, Johnson, and Dunlap (2008), which found that participants who used cannabis and tobacco together (or had tobacco

'chasers' immediately after using cannabis) were more likely to meet dependence criteria than those participants who did not use tobacco in this way. This association with dependence remained significant after controlling for frequency of use, tobacco use, solitary cannabis use, and demographic and socioeconomic factors.

Comparison Data

Key Aspects of Cannabis Use

In comparison to population levels of lifetime cannabis use, the participants in the current study were more likely to have used cannabis than the rate reported for the general populations in Australia, the USA and the UK (see Table 7.4). The participants were also over 3 times more likely to be daily or near daily cannabis users than members of the general population in Australia or the USA.

Table 7.4

Comparison of Cannabis Use by Participants with the Population Levels of use in Australia, the UK, and the USA

	Participants	Australia [a]	USA [b]	UK [c]
Lifetime use	95.6 %	33.6 %	40.1 %	30.8 %
Daily (or near daily) use*	60.4 %	16.4 %	13.3 %	-

[a] 2004 National Drug Strategy Household Survey (AIHW, 2005)
[b] 2005 National Survey on Drug Use and Health (SAMHSA, 2006))
[c] 2005 National Report to the EMCDDA (UK Focal Point on Drugs, 2005)
* Based on percentage of individuals using cannabis in the previous 12 months.

Study participants, with a mean duration of use of 13 years, had used cannabis for longer on average than Swift, Hall, and Copeland's (1998) urban sample of long-term users, who had been using for an average of 11 years. However, the participants in the present study had not used cannabis for as long as Reilly, Didcott, Swift, and Hall's (1998) rural sample of long-term users, who had an average duration of 19 years. Interestingly, both the

latter studies reported gender differences in duration of cannabis use, with males using for significantly longer than females (urban: 11 years vs. 9 years; rural: 20 years vs. 17 years). In the present study, although the male participants had used cannabis for longer then the female participants (13.9 years vs. 12.4 years), the difference was not statistically significant.

A total of 32% of the present study's daily cannabis using participants met proxy dependence criteria. This percentage was, unsurprisingly, substantially lower than the 96% of treatment-seeking cannabis users assessed as meeting proxy dependence criteria by Copeland, Swift, and Rees (2001). The proportion of participants meeting proxy dependence in the present study was also substantially lower that those reported for the urban (72%) and rural (57%) samples of long-term cannabis users (Copeland et al., 2001; Reilly et al., 1998). However, with 39% of daily cannabis users meeting proxy dependence criteria, Looby and Earleywine's research sample was similar to the present sample. A lower dependence rate of 20% of weekly cannabis users was reported by Swift, Coffey, Carlin, Degenhardt, and Patton (2008) for their longitudinal study of initially adolescent participants (14 years old at wave 1; 24 years old at wave 8). However, this reported dependency rate would presumably be higher if calculated solely in relation to the daily or near daily users in their sample.

It is likely that the lower dependence rates evident for the present sample and that assessed by Looby and Earleywine (2007) are related to the number of cones/joints consumed by participants. As indicated above (in Table 7.3), the weekly number of cones/joints consumed by participants was the variable most strongly associated with the number of proxy dependence criteria met by participants in the present study. Both the present sample and Looby and Earleywine's non-dependent sample had lower mean daily consumption levels (2.2/day and 2.0/day, respectively) than those reported for the urban (6/day) and the treatment (8/day) samples (Copeland et al., 2001; Looby & Earleywine, 2007; Swift, Hall, & Copeland, 1998). However, as indicated by the relevant multiple regression analyses, higher consumption alone does not equate to higher dependence. This is

also evident in relation to the higher proportion of dependent participants in the rural sample than the present sample, even though the rural sample had a low level of cannabis consumption, at 2 per day (Reilly et al., 1998). Furthermore, Looby and Earleywine's dependent sample reported a low level of daily consumption (2.4/day).

It is probable that the methodological similarity between the present study and that conducted by Looby and Earleywine also plays a role in relation to the similarity of findings. That is to say, both studies were Internet-based surveys that primarily recruited participants through online cannabis-using communities. Additionally, the participants recruited to both studies were similar in relation to their demographic profiles: 62% of participants in the present study and 64% of participants in Looby and Earleywine's sample were male, and the mean age of participants in the present study was 29.6 years (*SD* = 11.7; range: 18-70+) in comparison to a mean age of 33.0 years (*SD* = 11.7; range: 18-88). There were also marked similarities between these two research samples in relation to their use of other substances (as discussed in Chapter 3). Hence, it is probable that both of these studies have tapped into the same population of hidden (Internet-savvy) cannabis users.

Factors Associated with Key Aspects of Cannabis Use

Results from studies introduced in the discussion of initiation of cannabis use (Chapter 5) also provide appropriate comparison data for examining high levels and long durations of cannabis use, and dependence on the substance. Thus, comparison data from the German longitudinal EDSP study regarding high frequency cannabis use (von Sydow, Lieb, Pfister, Hofler, & Wittchen, 2002) and regular cannabis use (Hofler et al., 1999) are presented here, with additional findings from the Australian VAHC study, regarding risk factors for progression to cannabis dependence (Coffey et al., 2003)

In relation to demographic factors, being male was associated with higher levels of risk of cannabis use in all three comparison groups (Coffey et al., 2003; Hofler et al., 1999;

von Sydow et al., 2002), however, it was only found to be associated with peak levels of cannabis use, and not duration or dependence, in the present study. Corresponding to present findings for peak cannabis use, unemployment was linked to more frequent cannabis use in von Sydow et al.'s study, as was early tobacco use. Current poly-substance use, which was associated with both peak level of use and duration of use in the present study, was implicated in cannabis use in the studies by Hofler et al (1999) and von Sydow et al., while current tobacco use was associated with cannabis use in all three comparison samples, but only for peak use in the present study. Coffey et al. also found a strong association between delinquent behaviour and cannabis dependence, and having cannabis-using friends was found to be a risk factor for cannabis use in the studies by Hofler et al. and von Sydow et al. In the present study, delinquent behaviour was linked to all three key aspects of use, while peer use was implicated for both peak use and duration of use. The association between childhood psychopathology and cannabis use, reported by both Hofler et al. and Coffey et al., was not supported by findings in the present study, nor in the study by von Sydow et al.

Overall, the risk factors identified in relation to Hofler et al.'s (1999) regular cannabis users, von Sydow et al.'s (2002) high frequency users, and Coffey et al.'s (2003) dependent users, were most similar to the pattern of associations found in present study for peak level of cannabis use. Thus, there was evidence of disparate patterns of risk factors for the three key aspects of cannabis use investigated in the present study.

Conclusions

On examining all of the results presented in this Chapter, it is evident that the key factors predictive of peak cannabis use are peer cannabis use and use of tobacco, alcohol and other substances (current and past). These findings suggest that daily cannabis use is a normalised activity for many of the participants in the present sample, and tends to be just one aspect of their social, drug-using activities. Further, individuals who use cannabis for

long durations appear likely to also continue their use of other substances and continue to socialise with people who also use cannabis. In contrast, individuals are more likely to meet proxy cannabis dependence criteria if they tend to use cannabis alone. Additionally, while lifestyle factors explained a fair proportion of variance in peak levels of use and duration of use, these factors were largely unassociated with the number of proxy dependence criteria endorsed by the participants. Rather, dependence criteria were more strongly associated to patterns of cannabis use, particularly high quantity and high frequency of use, but also with lower overall dose (i.e., more tobacco in cones/joints). Thus, the factors associated with peak levels of cannabis are similar to those associated with long durations of use, but differ to those associated with cannabis dependence.

In the present study, age at initiation of use was not found to be associated with peak levels of use, duration of use, or the number of dependence criteria endorsed by the participants; this was unexpected. However, childhood/adolescent externalising behaviours were found to be associated with all three key aspects of cannabis use assessed above, and these behaviours were previously found to be associated with the initiation of cannabis use (in Chapter 5). This suggests that the early initiation of cannabis use is part of a broader pattern of externalising behaviours, with these behaviours associated with subsequent potentially problematic patterns of cannabis, rather than early initiation of use in isolation. Further, in Chapter 5 delinquent behaviour was found to be associated with adverse childhood environmental factors (e.g., family addiction problems, lack of adult support, coming from a single-parent family, and experiencing trauma in childhood); suggesting that an individual's externalising response to adverse life circumstances may be the key factor in linking early cannabis use to adverse outcomes of use, such as dependence on the substance.

Thus, childhood environmental factors appear to be implicated in externalising behaviours during childhood/adolescence, which may then progress to the heavy, prolonged, and/or dependent use of cannabis during adulthood. These findings provide support for the

latest results from the Christchurch Health and Development (CHD) Study (Fergusson, Boden, & Horwood, 2008). Fergusson et al. reported that the findings from their 25 year longitudinal study suggested that "…the development of illicit drug use and abuse/ dependence in adolescence and young adulthood involves an accumulative process that includes exposure to adversity in childhood [parental illicit drug use; exposure to sexual abuse], childhood adjustment [conduct problems], personality [high novelty-seeking] and individual [male gender] factors, the use of cannabis, affiliation with substance-using peers, and alcohol use…" (p.11). Further, the latter three factors were found to mediate the association between the childhood variables and other illicit substance use and abuse/ dependence, with cannabis use the most influential factor.

While the CHD study is extensive, both in the duration of data collection and the sheer amount of information gathered from each participant, there are some key aspects of cannabis use that appear not to have been fully explored: motives for cannabis use and the subjective experiences of such use. Knowing why individuals choose to use cannabis, and what they get out of the experience, is essential if we are to fully understand both cannabis use and cannabis users. These two aspects of cannabis use are investigated in the next chapter.

Cannabis Career Variables

A number of variables were described in this Chapter. Those that are utilised in future chapter are displayed in Table 7.5, while the descriptive statistics for these variables are provided in Appendix H17.

Table 7.5

Cannabis Career Variables

	Scoring Range	Score Interpretation
Cannabis Use Career Variables		
Peak use	1 – 8	Higher score = heavier use Where: 1 = 'never tried'; 2 = 'tried'; 3 = 'occasional/social use'; 4 = 'binge'; 5 = 'light'; 6 = 'moderate'; 7 = 'heavy'; 8 = 'very heavy'
Duration of use	0 – 58	Years of use
Proxy cannabis dependence	0 – 1	0 = Not dependent, 1 = Dependent
No. of proxy dependence criteria	0 – 7	Higher scores = more proxy dependence criteria endorsed

CHAPTER 8

MOTIVES FOR CANNABIS USE & SUBJECTIVE EXPERIENCES OF USE

Introduction

The second objective of the present study is to increase knowledge about, and understanding of, the nature of cannabis use. The participants' initiation to cannabis use was covered in Chapter 5, current patterns of use were examined in Chapter 6, while heavy, prolonged, and dependent use was investigated in Chapter 7. Another important issue, of which greater knowledge is necessary for gaining an understanding of cannabis users, relates to underlying motives for using cannabis. These reasons for use are also, inevitably, entwined with the subjective effects of use. Thus, the present chapter continues the exploration of aspects of current cannabis use, with an investigation of the motives that lead individuals to use cannabis and the subjective effects that are experienced while intoxicated. It is believed that examination of these aspects of cannabis use will reveal the presence of heterogeneity in the present sample.

Miller and Plant (2002) found that motives for cannabis use were related to lifestyle factors, such as quality of familial relationships, delinquent behaviour, and self-esteem. Brodbeck, Matter, Page and Moggi (2007) reported associations between different motives and levels of hedonism, psychopathology, psychosocial distress, and negative life events. Therefore, the present chapter will explore the associations between motives for cannabis use and both current and childhood lifestyle factors, as well as key aspects of cannabis use. It is hypothesised that individuals with differing life circumstances will use cannabis for different reasons.

The cannabis 'high' is typically characterized as including feelings of euphoria, relaxation, and increased sociability, as well as decreased feelings of anxiety, depression and tension, with anxiety-related effects the most commonly reported negative experiences of use (Ashton, 2001; Block, Erwin, Farinpour, & Braverman, 1998; Green, Kavanagh, & Young, 2003; Hammersley & Leon, 2006; Reilly, Didcott, Swift, & Hall, 1998). These effects are thought to be dose-dependent, with THC inducing mood amplifying effects in users. Thus, subjective experiences of cannabis use are thought to be affected by cannabis use factors as well as variables such as the context of use, the individual's previous experience with cannabis, individual and personality factors, and personal expectancies (Ashton, 2001; Block et al., 1998; Green et al., 2003). However, Green et al. noted that the associations between the subjective effects of cannabis use and the personal characteristics of users, the social and physical context of use, the frequency and duration of cannabis use, and THC dose, remained largely yet to be ascertained. Therefore, the present chapter will explore the associations between subjective experiences of use and patterns of cannabis use, including motives for use, and current and childhood lifestyle factors. It is hypothesised that differing patterns of cannabis use and life circumstances will be associated with different subjective experiences of cannabis use.

In summary, in the present chapter, the investigation initially focuses on the participants' motives for cannabis use, with second section of the chapter exploring the subjective experiences of cannabis use. The final section of the present chapter provides an overview of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample population in context, both in relation to cannabis-using populations and the general population.

Motives for Use

All participants who reported using cannabis in the 12 months prior to survey completion were asked to nominate how often (0 = 'never' to 4 = 'always') their use had been influenced by 17 different motivations for use (see Table 8.1). The most common motivation for using cannabis was simply enjoyment of cannabis use, which was reported as being a motive always or mostly by 84% of participants. The next most commonly reported motives were to relax or unwind, to have fun, to relieve boredom, and because it was available.

Table 8.1

Motivation for Using Cannabis in the Previous 12 Months

	Mostly or Always		**Sometimes**		**Never**	
Motivations for Use	*N*	%	*N*	%	*N*	%
Because enjoy using	659	83.7 %	88	11.2 %	41	5.2 %
To relax or unwind	497	63.1 %	237	30.0 %	54	6.9 %
To have fun	374	47.5 %	305	38.8 %	109	13.8 %
To relieve boredom	199	25.3 %	335	42.5 %	254	32.2 %
Because it was available	198	25.1 %	321	40.8 %	269	34.1 %
To help get to sleep	162	20.6 %	383	48.6 %	243	30.8 %
To socialise	141	17.9 %	428	54.4 %	219	27.8 %
To get out of it	141	17.9 %	281	35.7 %	366	46.4 %
To relieve physical pain	134	17.0 %	367	46.5 %	287	36.4 %
To relieve depression/anxiety	93	11.8 %	302	38.3 %	393	49.9 %
To celebrate	92	11.7 %	470	59.6 %	226	28.7 %
Because friends were using	79	10.0 %	140	30.5 %	469	59.5%
To avoid withdrawal symptoms	34	4.3 %	132	16.7 %	622	78.9 %
To feel normal or fit in	32	4.1 %	102	13.0 %	654	83.0 %
Ease comedown from other drug	19	2.4 %	151	19.2 %	618	78.4 %
No alcohol available	14	1.8 %	86	10.9 %	688	87.3 %
Felt pressured	4	0.6 %	36	12.7 %	748	94.9 %

In contrast, the least reported motivations for cannabis use were feeling pressured, using because alcohol was not available, easing the comedown from other drugs and, using cannabis to fit in or feel normal. While high proportions of the participants reported sometimes being motivated to use cannabis to celebrate, socialise, help with getting to sleep, and to relieve physical pain. It is interesting to note that 5% of participants reported that they were never motivated to use cannabis because they enjoy it. It is also evident that there is a large level of diversity evident across the participants with regards to their motivations for cannabis use (see Table 8.1).

Motives for Use Subscales

Due to the large number of items assessing motivation for cannabis use, it was deemed necessary to create subscales prior to further analysis. Therefore, the motivation variables were grouped together according to the type of reason described: self-medication, social/enhancement motives, and external influences. For this study, 'self-medication' was defined specifically as use to: relieve physical pain/discomfit, relieve depression and/or anxiety, or assist with sleep. This decision was based on the findings of Ware, Adams, and Guy (2005) and Swift, Gates, and Dillon (2005), which indicated that individuals self-identifying as medicinal users were most likely to be using to 'treat' symptoms such as pain and depression. However, sleep disturbance is a symptom of many of the other medical conditions indicated by the participants in these studies (e.g., MS, ME/CFS), while anxiety is often co-morbid with depression.

The three subscale scores were calculated through direct summation of the original questionnaire item scores. Internal consistency reliability was assessed for each of the new subjective experience subscales (see Table 8.2).

Table 8.2

Motivation for Cannabis Use Subscales

Self-Medication (α=.69)	**Social/Enhancement Motives** (α=.74)	**External Influences** (α=.64)
Relieve physical pain/discomfit	Because enjoy it	To fit in or feel normal
Reduce depression or anxiety	To have fun	Because friends were using it
Help in getting to sleep	To socialise	Because felt pressured to
	To celebrate an occasion	Couldn't get alcohol
	To relax or unwind	Because it was available
	To get out of it	Relieve/avoid withdrawal symptoms
	To relieve boredom	Ease comedown from other drugs

Self-Medication Subscale

The self-medication subscale contains three items and has a scoring range of 0-12. The mean subscale score for participants was 3.77 (*SD* = 2.92). A two-way ANOVA indicated a small gender effect ($F[1, 770] = 16.16$, $p < .001$, $\eta^2 = .021$), with the female participants (*M* = 4.34, *SD* = 3.09) being more likely to be motivated to use cannabis for self-medication than the male participants (*M* = 3.50, *SD* = 2.80). This gender difference seems to be primarily due to the high scoring older female participants (*M* = 5.25, *SD* = 3.34). No significant age or interaction effects were evident (see Figure 8.1 and Appendices I1 & I2).

Social/Enhancement Motives Subscale

The social/enhancement motives subscale has a scoring range of 0-28, and is comprised of seven items. The mean subscale score for participants was 13.73 (*SD* = 5.11). A two-way ANOVA indicated a moderate age effect ($F[4, 754] = 11.83$, $p < .001$, $\eta^2 = .059$), however no significant gender or interaction effects were evident (see Appendices I3-I4). A post hoc Tukey's HSD analysis indicated that social/enhancement motives scores decreased progressively with increasing age, with the teenagers and participants in their early twenties

having higher scores than participants aged in their thirties and over forty. Participants in their mid-late twenties also scored significantly higher on the social/enhancement motive subscale than the participants who were over forty years of age (see Figure 8.2 and Appendix I5).

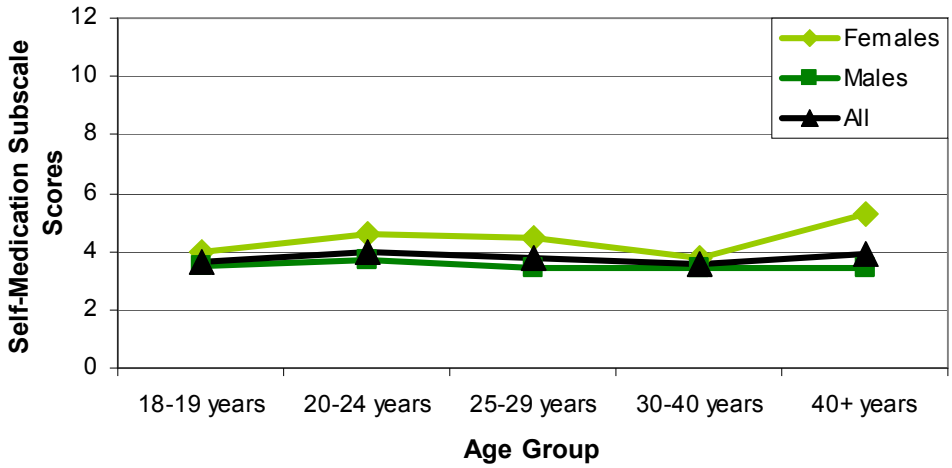

Figure 8.1. Self-medication subscale scores by age and gender.

External Influences Subscale

The external influences subscale, with seven items, has a scoring range of 0-28. The mean subscale score for participants was 3.62 (*SD* = 3.48). A two-way ANOVA indicated a moderate age effect ($F[4, 752] = 8.33$ $p < .001$, $\eta^2 = .042$), however no significant gender or interaction effects were evident (see Appendices I6 & I7). A post hoc Tukey's HSD analysis indicated that the teenagers and participants in their early twenties had significantly higher external influences subscale scores than both participants in their thirties) and those who were in their forties and older (see Figure 8.2 and Appendix I8).

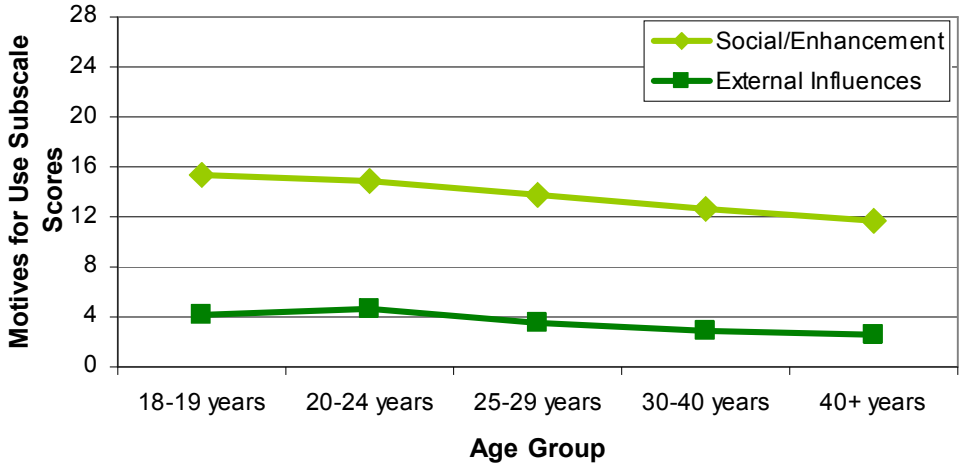

Figure 8.2. Social/enhancement motives and external influences subscale scores by age.

Factors Associated with Motivations for Use

To further understand why participants were influenced to use cannabis by the various motivations, preliminary correlation analyses were undertaken to determine the associations between childhood and current lifestyle factors and motives for cannabis use (see Appendix I9). Variables found to be significantly associated with the motivation to use subscales were then entered into stepwise multiple regression analyses. For each of the subscales four multiple regression analyses were completed; one each for childhood lifestyle factors, current lifestyle factors, and cannabis use factors, with the final multiple regression containing the variables that were significantly indicated in the prior analyses as being associated with the relevant motivation for cannabis use.

Self-Medication Subscale

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and self-medication motives for cannabis use, included nine variables: gender, proxy SES, unemployment, highest level of education, peer cannabis use, frequency

of alcohol use, poly substance use, and health and sleep problems. Five of these variables (gender, peer cannabis use, frequency of alcohol use, and health and sleep problems) were retained in the final regression model, explaining 20% of the variance in self-medication subscale scores: $F(5, 770) = 38.68$, $p < .001$ (see Table 8.3 and Appendix I10).

The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included six variables: family addiction problems, physical and sexual abuse, delinquent behaviour, running away from home, and psychopathology. Two of these variables (delinquent behaviour and psychopathology) were retained in the final regression model, explaining 9% of the variance in self-medication subscale scores: $F(2, 721) = 34.73$, $p < .001$ (see Table 8.3 and Appendix I10). The third stepwise multiple regression analysis, investigating associations with cannabis use factors, included five variables: age at initiation of cannabis use, peak level of use, proxy dependence, number of proxy dependence criteria, and solitary use. Three of these variables (peak level of use, number of proxy dependence criteria, and solitary use) were retained in the final regression model, explaining 26% of the variance in self-medication subscale scores: $F(3, 758) = 91.36$, $p < .001$ (see Table 8.3 and Appendix I10).

The final stepwise multiple regression analysis contained all 10 of the variables identified through the previous analyses as being significantly associated with self-medication subscale scores. Thus the analysis included five current lifestyle factors (sleep and health problems, peer cannabis use, frequency of alcohol consumption, and gender), two childhood lifestyle factors (psychopathology and delinquent behaviour), and three cannabis use factors (peak use, number of proxy dependence criteria, and solitary use). Seven of these variables were retained in the final regression model, explaining 36% of the variance in self-medication subscale scores: $F(7, 754) = 62.09$, $p < .001$ (see Table 8.3 and Appendix I10). These results indicate that participants reporting that their use of cannabis was influenced by self-medication motives were more likely to use cannabis alone, and experienced more health

problems, than participants not reporting these motives for use. Self-medication motives were also weakly associated with female gender, high peak levels of cannabis use, the endorsement of high numbers of dependence criteria, having experienced psychopathology during childhood, and having cannabis-using friends.

Table 8.3

Multiple Regression on Self-Medication Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* R^2 = .197)						
Health problems	0.61	0.09	0.24	6.76	<.001	.048
Sleep problems	0.68	0.11	0.22	6.31	<.001	.042
Peer cannabis use	0.43	0.09	0.15	4.68	<.001	.023
Current alcohol use	- 0.23	0.08	- 0.10	- 3.01	.003	.009
Gender	- 0.53	0.20	- 0.09	- 2.60	.010	.007
Childhood Lifestyle Factors (*Adj.* R^2 = .086)						
Childhood psychopathology	0.58	0.11	0.20	5.50	<.001	.037
Delinquent behaviour	0.09	0.02	0.20	5.45	<.001	.031
Cannabis Use Factors (*Adj.* R^2 = .263)						
Solitary use	0.92	0.09	0.35	10.39	<.001	.108
No. of proxy dependence criteria	0.32	0.07	0.17	4.84	<.001	.023
Peak level of use	0.31	0.07	0.16	4.58	<.001	.017
Final Regression Model (*Adj.* R^2 = .362)						
Solitary use	0.89	0.08	0.34	10.60	<.001	.095
Health problems	0.54	0.08	0.22	6.97	<.001	.041
Gender	- 0.86	0.19	- 0.14	- 4.59	<.001	.018
Peak level of use	0.27	0.07	0.14	4.15	<.001	.015
No. of proxy dependence criteria	0.25	0.06	0.13	3.93	<.001	.013
Childhood psychopathology	0.34	0.09	0.12	3.85	<.001	.013
Peer cannabis use	0.23	0.09	0.09	2.73	.007	.006

Social/Enhancement Motives Subscale

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and social/enhancement motives for cannabis use, included five variables: age group, single marital status, highest level of education, peer cannabis use, and sensation seeking. Three of these variables (all except marital status and education) were retained in the final regression model, explaining 13% of the variance in social/enhancement motives subscale scores: $F(3, 754) = 37.57$, $p < .001$ (see Table 8.4 and Appendix I10). The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included two variables: family addiction problems and delinquent behaviour. Only delinquent behaviour was retained in the final regression model, explaining just 1% of the variance in social/ enhancement motives scores: $F(1, 752) = 9.54$, $p = .002$ (see Table 8.4 and Appendix I10).

The third stepwise multiple regression analysis, investigating associations with cannabis use factors, included six variables: age at initiation of cannabis use, peak level of use, duration of use, proxy dependence, number of proxy dependence criteria, and solitary use. Three of these variables (peak level of use, duration of use, and number of proxy dependence criteria) were retained in the final regression model, explaining 14% of the variance in social/enhancement motives subscale scores: $F(3, 735) = 40.92$, $p < .001$ (see Table 8.4 and Appendix I10). The final stepwise multiple regression analysis contained all seven of the variables identified through the previous analyses as being significantly associated with social/enhancement motives subscale scores. Thus the analysis included three current lifestyle factors (age group, peer cannabis use, and sensation seeking), one childhood lifestyle factor (delinquent behaviour), and three cannabis use factors (duration of use, peak use, number of proxy dependence criteria). Four of these variables were retained in the final regression model, explaining 18% of the variance in social/enhancement motives subscale scores: $F(4, 738) = 42.05$ $p < .001$ (see Table 8.4 and Appendix I10). These results indicate

that participants reporting that their use of cannabis was influenced by social/enhancement motives endorsed higher numbers of the proxy dependence criteria, were younger, and had more cannabis-using friends, than participants not reporting these motives for use. Social/ enhancement motives were also weakly associated with high sensation seeking personality traits.

Table 8.4

Multiple Regression on Social/Enhancement Motives Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* R^2 = .127)						
Peer cannabis use	0.96	0.17	0.19	5.58	<.001	.036
Age group	- 0.66	0.13	- 0.18	- 5.08	<.001	.030
Sensation seeking	0.17	0.04	0.16	4.42	<.001	.023
Childhood Lifestyle Factors (*Adj.* R^2 = .011)						
Delinquent behaviour	0.09	0.03	0.11	3.09	.002	.031
Cannabis Use Factors (*Adj.* R^2 = .140)						
Duration of use	- 0.11	0.02	- 0.25	- 7.32	<.001	.054
No. of proxy dependence criteria	0.70	0.13	0.21	5.52	<.001	.035
Peak level of use	0.45	0.13	0.13	3.46	<.001	.026
Final Regression Model (*Adj.* R^2 = .186)						
No. of proxy dependence criteria	0.82	0.11	0.24	7.27	<.001	.059
Age group	- 0.67	0.13	- 0.19	- 5.26	<.001	.030
Peer cannabis use	0.85	0.17	0.17	4.98	<.001	.028
Sensation seeking	0.15	0.04	0.14	3.96	<.001	.018

External Influences Subscale

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and external influence for cannabis use, included five variables: age

group, single marital status, highest level of education, peer cannabis use, and sensation seeking. Two of these variables (age group and sensation seeking) were retained in the final regression model, explaining 5% of the variance in external influences subscale scores: $F(2, 752) = 19.85$, $p < .001$ (see Table 8.5 and Appendix I10).

The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included two variables: family addiction problems and delinquent behaviour. Only delinquent behaviour was retained in the final regression model, explaining 2% of the variance in external influence subscale scores: $F(1, 750) = 16.87$, $p < .001$ (see Table 8.5 and Appendix I10). The third stepwise multiple regression analysis, investigating associations with cannabis use factors, included five variables: age at initiation of cannabis use, peak level of use, duration of use, proxy dependence, and number of proxy dependence criteria. Two of these variables (number of proxy dependence criteria and duration of use) were retained in the final regression model, explaining 16% of the variance in external influences subscale scores: $F(2, 736) = 68.66$, $p < .001$ (see Table 8.5 and Appendix I10).

The final stepwise multiple regression analysis contained all five of the variables identified through the previous analyses as being significantly associated with external influences subscale scores. Thus the analysis included two current lifestyle factors (age group and sensation seeking), one childhood lifestyle factor (delinquent behaviour), and two cannabis use factors (duration of use and number of proxy dependence criteria). Only two of these variables were retained in the final regression model, explaining 17% of the variance in external influences subscale scores: $F(2, 736) = 75.15$, $p < .001$ (see Table 8.5 and Appendix I10). These results indicate that participants reporting that their use of cannabis was influenced by external influences motives endorsed higher numbers of the proxy dependence criteria, and were younger, than participants not reporting these motives for use.

Table 8.5

Multiple Regression on External Influences Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* R^2 = .048)						
Age group	- 0.44	0.09	- 0.18	- 4.75	<.001	.029
Sensation seeking	0.07	0.03	0.10	2.70	.007	.009
Childhood Lifestyle Factors (*Adj.* R^2 = .021)						
Delinquent behaviour	0.08	0.02	0.15	4.11	<.001	.023
Cannabis Use Factors (*Adj.* R^2 = .155)						
No. of proxy dependence criteria	0.82	0.08	0.36	10.53	<.001	.134
Duration of use	- 0.05	0.01	- 0.15	- 4.55	<.001	.016
Final Regression Model (*Adj.* R^2 = .168)						
No. of proxy dependence criteria	0.82	0.08	0.36	10.64	<.001	.129
Age group	- 0.47	0.08	- 0.19	- 5.65	<.001	.036

Subjective Experience of Cannabis Use

All participants who reported using cannabis in the 12 months prior to survey completion were asked to nominate how often (0 = 'never' to 4 = 'always') they had encountered 27 subjective experiences of cannabis intoxication (see Table 8.6).

The most common subjective effect of cannabis use reported as being experienced always or mostly by participants was feeling happy (82%). The next most commonly reported experience of use was finding it easier to sleep, while approximately half of the participants reported always or mostly getting the 'munchies, and dry mouth and throat. The least reported subjective effects of cannabis use experienced were feeling suicidal, sick, dizzy, or faint, depressed, and, anxious or panicky (see Table 8.6).

Table 8.6

Subjective Effects of Cannabis Experienced in the Previous 12 Months

	Mostly or Always		**Sometimes**		**Never**	
Subjective Experiences	*N*	%	*N*	%	*N*	%
Felt happy	647	82.3 %	123	15.6%	17	2.2 %
Found it easier to sleep	522	66.2 %	211	26.8 %	55	7.0 %
Had the munchies	401	50.9 %	323	41.0 %	64	8.1 %
Dry mouth and throat	390	49.5 %	358	45.4 %	40	5.1 %
Laughed more than usual	352	44.7 %	369	46.8 %	67	8.5 %
Taste/smell enhanced	339	43.0 %	297	37.7 %	152	19.3 %
Bloodshot eyes	338	42.9 %	335	42.5 %	115	14.6 %
Experienced greater insight	334	42.3 %	338	42.9 %	116	14.7 %
Colours/sounds more intense	288	36.5 %	324	41.1 %	176	22.3 %
Felt elated or euphoric	270	34.3 %	371	47.1 %	147	18.7 %
Felt excited	269	34.1 %	417	52.9 %	102	12.9 %
Socialising was easier	227	28.8 %	395	50.2 %	166	21.1%
Talked more than usual	179	22.8 %	438	55.6 %	171	21.7 %
Uninhibited behaviour	121	15.4 %	388	49.3 %	279	35.4 %
Felt apathetic/unmotivated	120	15.2 %	434	55.1 %	234	29.7 %
Intense focus	117	14.9 %	468	59.4 %	203	25.8 %
Time perception affected	95	12.0 %	431	54.7 %	262	33.2 %
Felt distant/separate from reality	94	11.9 %	352	44.7 %	342	43.4 %
Worried about breaking the law	75	9.5 %	243	30.8 %	470	59.6%
Coordination affected	65	8.3 %	370	47.0 %	353	44.8 %
Felt confused	59	7.5 %	433	54.9 %	296	37.6 %
Became paranoid	49	6.2 %	360	45.6 %	379	48.1 %
Hallucinated	38	4.9 %	237	31.1 %	513	65.1 %
Felt anxious/panicky	30	3.8 %	308	39.0 %	450	57.1 %
Felt depressed	20	2.6 %	254	32.2 %	514	65.2 %
Felt sick, dizzy, or faint	19	2.4 %	222	28.1 %	547	69.4 %
Felt suicidal	9	1.2 %	44	5.5 %	735	93.3 %

Subjective Experience Subscales

Due to the large number of subjective experience items, it was deemed necessary to create subscales prior to further analysis. Therefore, subjective experience variables were grouped together according to the type of effects described: altered reality, psychopathological experience, enhanced experience, and physiological effects. One subjective experience item, being worried about breaking the law, was excluded from this process because it was qualitatively different from all of the other items and, thus, not validly able to be categorised. The four subscale scores were calculated through direct summation of the original questionnaire item scores. Internal consistency reliability was assessed for each of the new subjective experience subscales (see Table 8.7).

Table 8.7

Subjective Experience Subscales

Altered Reality (α=.80)	**Psychopathological Experience** (α=.72)	**Enhanced Experience** (α=.77)	**Physiological Effects** (α=.70)
Distant from reality	Anxious	Elated or euphoric	'Munchies'
Hallucinations	Depressed	Excited	Bloodshot eyes
Greater insight	Paranoid	Happy	Dry mouth/throat
Confused	Suicidal	Laugh more	Coordination
Sights/sounds altered		Talk more	Easier to sleep
Taste/smell altered		Easier to socialise	Apathetic
Time perception		Uninhibited	Sick, dizzy, faint
Intense focus			

Altered Reality Subscale

The altered reality subscale contains eight items and has a scoring range of 0-32. The mean subscale score for participants was 11.14 (*SD* = 5.99). A two-way ANOVA indicated a

moderate age effect ($F[4, 787] = 19.89$, $p < .001$, $\eta^2 = .091$), however no significant gender or interaction effects were evident (see Appendices I11 & I12). A post hoc Tukey's HSD analysis indicated that altered reality scores tended to decrease with increasing age, such that the teenagers and participants in their early twenties had significantly higher scores than all other age groups, while participants in their mid-late twenties had a significantly higher score than the participants who were aged forty years and older (see Figure 8.3 and Appendix I13).

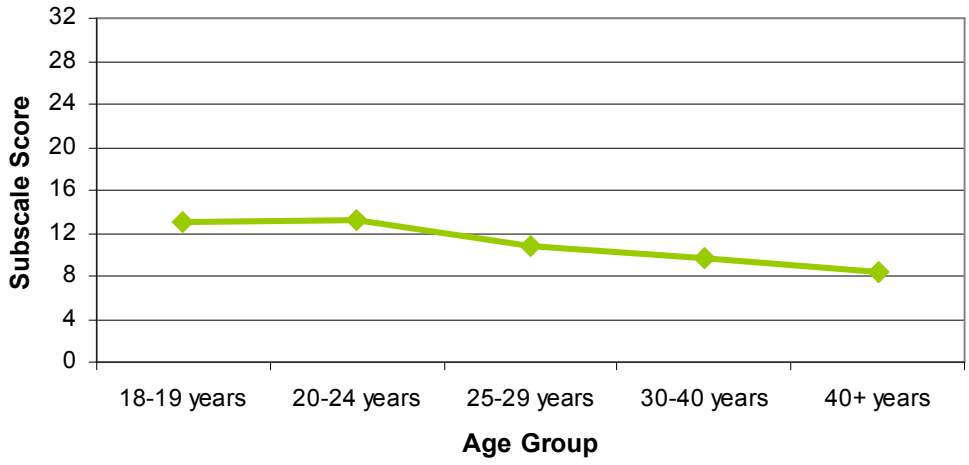

Figure 8.3. Altered reality subscale scores by age group.

Psychopathological Experience Subscale

Consisting of four items, the psychopathological experience subscale has a scoring range of 0-16. The mean subscale score for participants was 2.01 ($SD = 2.31$). A two-way ANOVA indicated a medium age effect ($F[4, 787] = 6.87$, $p < .001$, $\eta^2 = .033$), however no significant gender or interaction effects were evident (see Appendices I14 & I15). A post hoc Tukey's HSD analysis indicated the participants who were aged forty years and older had significantly lower psychopathological experience scores than all other age groups (see Figure 8.4 and Appendix I16).

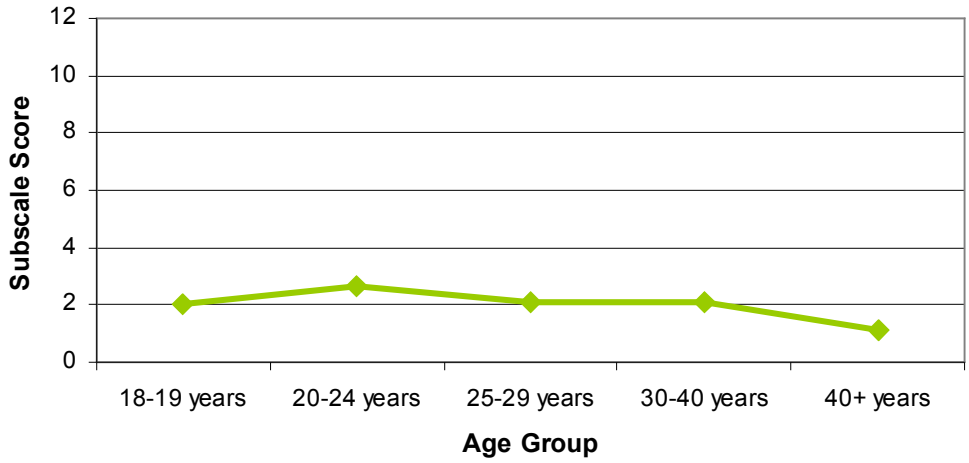

Figure 8.4. Psychopathological experiences subscale scores by age group.

Enhanced Experience Subscale

The enhanced experience subscale has a scoring range of 0-28, and is comprised of seven items. The mean subscale score for participants was 13.80 (SD = 5.23). A two-way ANOVA indicated a moderate age effect ($F[4, 786] = 9.50$, $p < .001$, $\eta^2 = .045$), however no significant gender or interaction effects were evident (see Appendices I17 & I18). A post hoc Tukey's HSD analysis indicated that enhanced experience scores decreased progressively with increasing age, with the teenagers having significantly higher scores than participants aged over 24 years, while participants in their early twenties had significantly higher scores than the participants who were aged forty years and older (see Figure 8.5 and Appendix I19).

Physiological Effects Subscale

The physiological effects subscale, with seven items, has a scoring range of 0-28. The mean subscale score for participants was 12.25 (SD = 4.62). A two-way ANOVA indicated a moderate age effect ($F[4, 787] = 15.81$, $p < .001$, $\eta^2 = .073$), however no significant gender or interaction effects were evident (see Appendices I20 & I21). A post hoc Tukey's HSD analysis indicated that physiological effects scores decreased progressively with increasing

age, such that the teenagers and participants in their early twenties had significantly higher scores than both participants in their thirties and those who were aged forty years and older. Furthermore, the participants in their forties and older had significantly lower physiological effects subscale scores than all other age groups (see Figure 8.5 and Appendix I22).

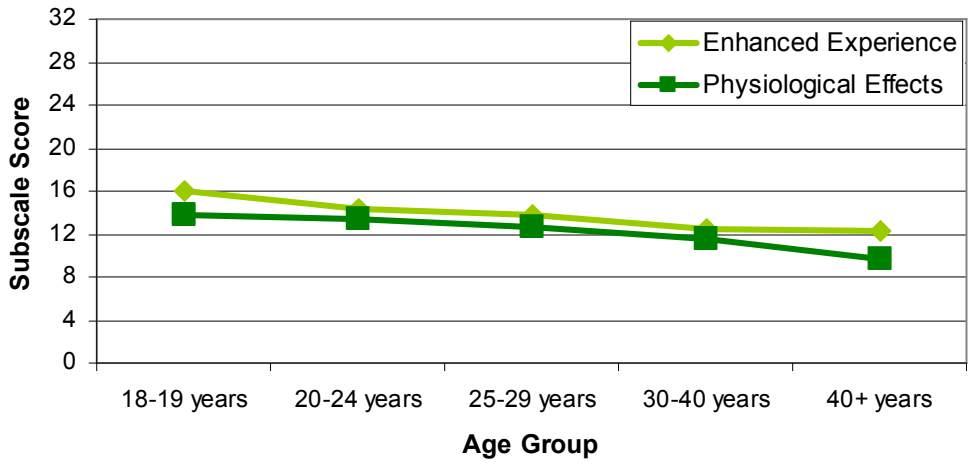

Figure 8.5. Enhanced experiences and physiological effects subscale scores by age group.

Factors Associated with Subjective Experiences of Use

To further understand why participants have different subjective experiences of cannabis use preliminary correlation analyses were undertaken to determine the associations between subjective experience subscale scores and childhood and current lifestyle factors, cannabis use factors, and motives and intoxication factors (see Appendix I23). Variables found to be significantly associated with the subjective experience subscales were then entered into stepwise multiple regression analyses. For each of the subscales five multiple regression analyses were completed; one each for childhood lifestyle factors, current lifestyle factors, cannabis use factors, and motives for use factors, with the final multiple regression

containing the variables that were significantly indicated in the prior analyses as being associated with the relevant subjective experience of use subscale.

Altered Reality Subscale

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and altered reality experiences of cannabis use, included five variables: age group, single marital status, unemployment, highest level of education, and sensation seeking. Three of these variables (age group, single marital status, and sensation seeking) were retained in the final regression model, explaining 14% of the variance in altered reality subscale scores: $F(3, 787) = 43.44$, $p < .001$ (see Table 8.8 and Appendix I24). The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included two variables: proxy SES and psychopathology. Both of these variables were retained in the final regression model, explaining 3% of the variance in altered reality subscale scores: $F(2, 781) = 14.35$, $p < .001$ (see Table 8.8 and Appendix I24).

The third stepwise multiple regression analysis, investigating associations with cannabis use factors, included six variables: duration of cannabis use, proxy dependence, number of proxy dependence criteria, concurrent substance use, and normal and highest levels of intoxication. Four of these variables (all except proxy dependence and concurrent substance use) were retained in the final regression model, explaining 22% of the variance in altered reality subscale scores: $F(4, 757) = 55.14$, $p < .001$ (see Table 8.8 and Appendix I24). The fourth stepwise multiple regression analysis, investigating associations with motives for cannabis use, included all three subscales: self-medication, external influences, and social/enhancement motives. Only self-medication motivations for use was not retained in the final regression model, with the other two variables explaining 22% of the variance in altered reality subscale scores: $F(2, 727) = 100.97$, $p < .001$ (see Table 8.8 and Appendix I24).

Table 8.8

Multiple Regression on Altered Reality Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* R^2 = .139)						
Sensation seeking	0.27	0.04	0.21	6.11	<.001	.041
Age group	- 0.84	0.16	- 0.20	- 5.16	<.001	.029
Single marital status	1.27	0.46	0.10	2.79	.005	.008
Childhood Lifestyle Factors (*Adj.* R^2 = .033)						
Childhood psychopathology	0.97	0.21	0.16	4.58	<.001	.026
Proxy SES (parental)	- 0.29	0.10	- 0.10	- 2.89	.004	.010
Cannabis Use Factors (*Adj.* R^2 = .222)						
Duration of use	- 0.68	0.09	- 0.24	- 7.16	<.001	.052
Highest level of intoxication	1.39	0.22	0.24	6.35	<.001	.041
Normal level of intoxication	0.62	0.21	0.12	3.02	.003	.009
No. of proxy dependence criteria	0.38	0.13	0.10	3.00	.003	.009
Motives for Use Factors (*Adj.* R^2 = .216)						
Social/enhancement motives	0.45	0.04	0.39	10.45	<.001	.118
External influences motive	0.24	0.06	0.14	3.78	<.001	.015
Final Regression Model (*Adj.* R^2 = .341)						
Social/enhancement motives	0.38	0.04	0.32	10.00	<.001	.094
Highest level of intoxication	1.47	0.18	0.26	8.09	<.001	.062
Duration of use	- 0.50	0.09	- 0.18	- 5.46	<.001	.028
Sensation seeking	0.17	0.04	0.13	4.11	<.001	.016

The final stepwise multiple regression analysis contained all 11 of the variables identified through the previous analyses as being significantly associated with altered reality subscale scores. Thus the analysis included three current lifestyle factors (age group, single marital status, and sensation seeking), two childhood lifestyle factors (psychopathology and

proxy SES), four cannabis use factors (duration, number of proxy dependence criteria, and normal and highest levels of intoxication), and two motives for use factors (external influences and social/enhancement motives). Four of these variables were retained in the final regression model, explaining 34% of the variance in altered reality subscale scores: $F(4, 703) = 91.87$, $p < .001$ (see Table 8.8 and Appendix I24). These findings indicated that participants experiencing altered reality subjective experiences of cannabis use were more likely to have been influenced by social/enhancement motives, attained higher levels of intoxication, and been using cannabis for shorter durations, than participants not experiencing these effects of use. Altered reality experiences of use were also weakly associated with high sensation seeking personality traits.

Psychopathological Experience Subscale

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and psychopathological experiences of cannabis use, included seven variables: age group, single marital status, proxy SES, frequency of alcohol and tobacco use, and sleep and health problems. Four of these variables (age group, health problems, and alcohol and tobacco use) were retained in the final regression model, explaining 7% of the variance in psychopathological experience subscale scores: $F(4, 787) = 13.47$, $p < .001$ (see Table 8.9 and Appendix I24). The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included four variables: exposure to domestic violence, lack of adult support, delinquent behaviour, and psychopathology. Only the lack of adult support or help when needed was not retained in the final regression model, with the other three variables explaining 4% of the variance in psychopathological experience subscale scores: $F(3, 781) = 11.65$, $p < .001$ (see Table 8.9 and Appendix I24).

The third stepwise multiple regression analysis, investigating associations with cannabis use factors, included 11 variables: duration of cannabis use, weekly number of

cones/joints, proxy dependence, number of proxy dependence criteria, concurrent use of alcohol, tobacco, and other substances, proportion of cannabis in cones/joints, strength of cones/joints, and both normal and highest level of intoxication. Three of these variables (number of proxy dependence criteria, highest level of intoxication, and strength of cones/joints) were retained in the final regression model, explaining 23% of the variance in psychopathological experience subscale scores: $F(3, 749) = 39.01$, $p < .001$ (see Table 8.9 and Appendix I24). The fourth stepwise multiple regression analysis, investigating associations with motives for cannabis use, included all three subscales: self-medication, external influences, and social/enhancement motives. Only external influences motives was retained in the final regression model, explaining 13% of the variance in psychopathological experience subscale scores: $F(1, 727) = 110.15$, $p < .001$ (see Table 8.9 and Appendix I24).

The final stepwise multiple regression analysis contained all 11 of the variables identified through the previous analyses as being significantly associated with psychopathological experience subscale scores. Thus the analysis included four current lifestyle factors (age group, health problems, and tobacco and alcohol use), three childhood lifestyle factors (psychopathology, delinquent behaviour, and domestic violence), three cannabis use factors (number of proxy dependence criteria, strength of cones/joints, and highest level of intoxication), and one motives for use factor (external influences). Six of these variables were retained in the final regression model, explaining 23% of the variance in psychopathological experience subscale scores: $F(6, 715) = 36.08$, $p < .001$ (see Table 8.9 and Appendix I24). These findings indicated that participants experiencing psychopathological subjective experiences of cannabis use were more likely to have been motivated by external influences, attained higher levels of intoxication, and endorsed higher numbers of proxy dependence criteria, than participants not experiencing these effects of use. Psychopathological experiences of use were also weakly associated with the consumption of weaker cones/joints, higher levels of health problems, and more frequent alcohol use.

Table 8.9

Multiple Regression on Psychopathological Experience Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* R^2 = .073)						
Age group	- 0.24	0.06	- 0.14	- 4.07	<.001	.016
Alcohol use	0.23	0.06	0.13	3.63	<.001	.015
Tobacco use	0.12	0.04	0.11	3.23	.001	.012
Health problems	0.23	0.08	0.12	3.02	.003	.011
Childhood Lifestyle Factors (*Adj.* R^2 = .039)						
Delinquent behaviour	0.05	0.01	0.13	3.67	<.001	.017
Childhood psychopathology	0.26	0.08	0.11	3.21	.001	.013
Domestic violence	0.23	0.08	0.10	2.85	.004	.010
Cannabis Use Factors (*Adj.* R^2 = .233)						
No. of proxy dependence criteria	0.61	0.08	0.39	8.15	<.001	.135
Highest level of intoxication	0.33	0.11	0.14	2.95	.003	.018
Strength of cones/joints	- 0.06	0.02	- 0.13	- 2.76	.006	.016
Motives for Use Factors (*Adj.* R^2 = .131)						
External influences motive	0.23	0.02	0.36	10.50	<.001	.132
Final Regression Model (*Adj.* R^2 = .227)						
External influences motive	0.16	0.02	0.24	6.68	<.001	.050
Highest level of intoxication	0.43	0.07	0.20	5.80	<.001	.036
No. of proxy dependence criteria	0.24	0.05	0.16	4.50	<.001	.022
Strength of cones/joints	- 0.05	0.02	- 0.12	- 3.47	.001	.012
Health problems	0.23	0.07	0.12	3.40	.001	.012
Alcohol use	0.21	0.06	0.11	3.37	.001	.011

Enhanced Experience Subscale

Interestingly, none of the childhood lifestyle variables were significantly correlated with enhanced experience subscale scores. Hence, only four stepwise multiple regressions were employed to investigate factors associated with this subjective experience of cannabis use. The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and enhanced experiences of cannabis use, included five variables: age group, single marital status, unemployment, sensation seeking, and peer cannabis use. Two of these variables (age group and sensation seeking) were retained in the final regression model, explaining 10% of the variance in enhanced experience subscale scores: $F(2, 786) = 42.76$, $p < .001$ (see Table 8.10 and Appendix I24).

The second stepwise multiple regression analysis, investigating associations with cannabis use factors, included six variables: duration of cannabis use, concurrent use of alcohol, cannabis potency, strength of cones/joints, and normal and highest levels of intoxication. Three of these variables (duration, strength of cones/joints, and highest level of intoxication) were retained in the final regression model, explaining 13% of the variance in enhanced experience subscale scores: $F(3, 765) = 37.80$, $p < .001$ (see Table 8.10 and Appendix I24). The third stepwise multiple regression analysis, investigating associations with motives for cannabis use, included all three subscales: self-medication, external influences, and social/enhancement motives. Only social/enhancement motives were retained in final regression model, explaining 28% of the variance in enhanced experience subscale scores: $F(1, 726) = 278.04$, $p < .001$ (see Table 8.10 and Appendix I24).

The final stepwise multiple regression analysis contained all six of the variables identified through the previous analyses as being significantly associated with enhanced experience subscale scores. Thus the analysis included two current lifestyle factors (age group and sensation seeking), no childhood lifestyle factors, three cannabis use factors (duration, strength of cones/joints, and highest level of intoxication), and one motives factors

(social/enhancement motives). Four of these variables were retained in the final regression model, explaining 33% of the variance in enhanced experience subscale scores: $F(4, 731) = 91.71$, $p < .001$ (see Table 8.10 and Appendix I24). These findings indicated that participants experiencing enhanced subjective experiences of cannabis use were more likely to have been influenced by social/enhancement motives, and attained higher levels of intoxication, than participants not experiencing these effects of use. Enhanced experiences of use were also weakly associated with shorter durations of use, and high sensation seeking personality traits.

Table 8.10

Multiple Regression on Enhanced Experience Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* $R^2 = .096$)						
Sensation seeking	0.22	0.04	0.20	5.73	<.001	.038
Age group	- 0.72	0.13	- 0.19	- 5.50	<.001	.035
Cannabis Use Factors (*Adj.* $R^2 = .126$)						
Highest level of intoxication	1.09	0.17	0.23	6.51	<.001	.048
Duration of use	- 0.54	0.08	- 0.22	- 6.45	<.001	.045
Strength of cones/joints	- 0.10	0.03	- 0.10	- 2.99	.003	.010
Motives for Use Factors (*Adj.* $R^2 = .276$)						
External influences motive	0.54	0.03	0.53	16.68	<.001	.277
Final Regression Model (*Adj.* $R^2 = .332$)						
Social/enhancement motives	0.47	0.03	0.45	14.14	<.001	.182
Highest level of intoxication	0.76	0.16	0.15	4.85	<.001	.021
Duration of use	- 0.26	0.08	- 0.11	- 3.29	.001	.010
Sensation seeking	0.11	0.04	0.10	3.01	.003	.008

Physiological Effects Subscale

The first stepwise multiple regression analysis, investigating associations between current lifestyle factors and physiological effects of cannabis use, included seven variables: age group, single marital status, frequency of alcohol and tobacco use, highest level of education, sensation seeking, and peer cannabis use. Only two of these variables (age group and tobacco use) were retained in the final regression model, explaining 12% of the variance in physiological effects subscale scores: $F(2, 787) = 54.08$, $p < .001$ (see Table 8.11 and Appendix I24). The second stepwise multiple regression analysis, investigating associations with childhood lifestyle factors, included two variables: family addiction problems and delinquent behaviour. Both of these variables were retained in the final regression model, explaining 3% of the variance in physiological effects subscale scores: $F(2, 785) = 11.73$, $p < .001$ (see Table 8.11 and Appendix I24).

The third stepwise multiple regression analysis, investigating associations with cannabis use factors, included 13 variables: age at initiation, peak level of use, duration of cannabis use, proxy dependence, number of proxy dependence criteria, frequency of use, concurrent use of alcohol, tobacco, and other substances, proportion of cannabis in cones/joints, weekly number of cones/joints, and normal and highest levels of intoxication. Five of these variables (duration, number of proxy dependence criteria, concurrent substance use, and normal and highest levels of intoxication) were retained in the final regression model, explaining 31% of the variance in physiological effects subscale scores: $F(5, 671) = 35.12$, $p < .001$ (see Table 8.11 and Appendix I24). The fourth stepwise multiple regression analysis, investigating associations with motives for cannabis use and levels of intoxication, included all three subscales: self-medication, external influences, and social/enhancement motives. Only one of these variables (self-medication motives) was not retained in the final regression model, with the other two variables explaining 23% of the variance in

physiological effects subscale scores: $F(2, 727) = 108.34$, $p < .001$ (see Table 8.11 and Appendix I24).

Table 8.11

Multiple Regression on Physiological Effects Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Current Lifestyle Factors (*Adj.* $R^2 = .119$)						
Age group	- 0.98	0.11	- 0.30	- 8.90	<.001	.089
Tobacco use	0.35	0.07	0.16	4.84	<.001	.026
Childhood Lifestyle Factors (*Adj.* $R^2 = .027$)						
Delinquent behaviour	0.08	0.03	0.11	3.14	.002	.012
Family problems	0.41	0.14	0.11	3.00	.003	.011
Cannabis Use Factors (*Adj.* $R^2 = .314$)						
No. of proxy dependence criteria	0.69	0.13	0.25	5.42	<.001	.054
Duration of use	- 0.41	0.10	- 0.18	- 3.92	<.001	.028
Concurrent alcohol use	1.24	0.35	0.16	3.60	.001	.024
Normal level of intoxication	0.69	0.20	0.19	3.53	<.001	.023
Highest level of intoxication	0.68	0.22	0.16	3.12	<.001	.018
Motives for Use Factors (*Adj.* $R^2 = .228$)						
Social/enhancement motives	0.34	0.03	0.38	10.26	<.001	.112
External influences motive	0.23	0.05	0.17	4.68	<.001	.023
Final Regression Model (*Adj.* $R^2 = .352$)						
Social/enhancement motives	0.24	0.03	0.27	7.63	<.001	.055
Age group	- 0.44	0.11	- 0.13	- 3.99	<.001	.014
Normal level of intoxication	0.58	0.15	0.15	3.86	<.001	.014
Highest level of intoxication	0.60	0.16	0.14	3.80	<.001	.013
No. of proxy dependence criteria	0.37	0.10	0.12	3.61	<.001	.013
Tobacco use	0.19	0.07	0.10	2.89	.004	.007
External influences motive	0.12	0.05	0.09	2.59	.010	.006

The final stepwise multiple regression analysis contained all 11 of the variables identified through the previous analyses as being significantly associated with physiological effects subscale scores. Thus the analysis included two current lifestyle factors (age group and tobacco use), two childhood lifestyle factors (family problems and delinquent behaviour), five cannabis use factors (duration, number of proxy dependence criteria, concurrent alcohol use, and both normal and highest levels of intoxication), and two motives for use factors (external influences and social/enhancement motives). Seven of these variables were retained in the final regression model, explaining 35% of the variance in physiological effects subscale scores: $F(7, 697) = 55.07$, $p < .001$ (see Table 8.11 and Appendix I24).

These findings indicated that participants experiencing physiological effects of cannabis use were more likely to have been influenced by social/enhancement motives than participants not experiencing these effects of use. Physiological effects of use were also weakly associated with young age, high levels of intoxication (both normal and highest), the endorsement of proxy dependence criteria, frequent tobacco use, and external influences motives for use.

Summary & Discussion

Chapter Summary

This chapter provided a detailed examination of the participants' motives for using cannabis and their subjective experiences of such use, thus addressing the second objective of the present study: to increase knowledge about, and understanding of, the nature of cannabis use.

The majority (84%) of participants reported being motivated to use cannabis because they enjoyed using it, thus participants were primarily influenced by social/enhancement motives, with few using in response to self-medication or external influences motives.

However, female participants were more likely to use cannabis for self-medication purposes than the male participants, and younger participants were more likely to use cannabis for social/enhancement motives and due to external influences than the older participants.

Self-medication motives were found to be primarily associated with solitary cannabis use and experiencing health problems. However, female gender, peak level of cannabis use, the number of proxy dependence criteria endorsed, childhood psychopathology, and having friends who use cannabis, all contributed to the explanation of 36% of variance in the participants' self-medication subscale score. The key factors associated with social/enhancement motives were the number of proxy dependence criteria endorsed, younger age, having cannabis-using friends, and high sensation seeking traits, together accounting for 18% of the variance scores. Similarly, 17% of variance in external influences subscale scores was explained by number of proxy dependence criteria and younger age. Thus, the number of proxy dependence criteria reported by the participants was significantly related to all three motives for use subscales, indicating that those with higher levels of dependence on cannabis were more likely to report being influenced to use cannabis for all motives.

Age effects were indicated for all four subjective experiences subscales, with scores tending to decrease progressively with increasing age. No gender effects were indicated. Altered reality and enhanced experiences of cannabis use were both associated significantly with social/enhancement motives, high levels of intoxication, shorter durations of use, and sensation seeking traits. These factors explained 34% of the variance in the participants' altered reality subscale scores, and 33% of the variance in enhanced experience subscale scores. While high levels of intoxication were also significantly associated with psychopathological experience subscale scores, the other implicated factors were quite different: external influences motives, number of proxy dependence criteria, weaker cones/joints, health problems, and alcohol frequency. These six factors explained 23% of the

variance in the participants' psychopathological experience subscale scores. Similarly, 35% of physiological effects subscale scores were explained by social/enhancement motives, younger age, both normal and highest levels of intoxication, number of proxy dependence criteria, current tobacco use, and external influences motives. With levels of intoxication significantly associated with all four subjective experience subscales, it is apparent that these effects of use are in some part dose dependent. That is, levels of intoxication give an indication of cannabis dose while also being affected by individual differences such as cannabis tolerance levels.

Comparison Data

Motives for Cannabis Use

The proportion of participants in the present study reporting being motivated to use cannabis because they enjoyed using it, at 84%, was much higher than the 27% of rural long-term cannabis users who reported enjoyment of cannabis as a motivation for use (Reilly et al., 1998). However, the proportion of participants reporting using cannabis to relax or unwind in the present sample (63%) was similar to that reported for the rural sample (61%) and also the urban, long-term users (60%) assessed by Swift, Hall, and Copeland (1998). Interestingly, only 2% of Green, Kavanagh, and Young's (2004) sample of men experiencing psychosis reported using cannabis for relaxation, while 34% of their control group reported this motive for use. The present sample was also more similar to Green et al.'s control group than psychosis group in relation to addiction-related motivation (avoidance of withdrawal symptoms) and use aimed at the relief of anxiety and/or depression: these motivations were reported respectively by 4% and 12% of the present sample, 4% and 11% of the control group, and 13% and 27% of the psychosis group. Although, with a quarter of the present sample using cannabis to relieve boredom and because cannabis was available, the

participants were more similar to Green et al's psychosis group (22% and 24%, respectively) than their control group (17% and 15%, respectively) in relation to these motive for use.

Subjective Experiences of Use

It can be expected that the motives for cannabis use are based on prior subjective experiences of use. Thus, with 84% of participants reporting that they were mostly or always motivated to use cannabis because they enjoy using it, it is not surprising that 82% reported feeling happy as the subjective experience they mostly or always encountered. It is interesting, however, that only 24% of Copeland, Swift, and Rees' (2001) treatment-seeking cannabis users reported that cannabis made them feel good. Furthermore, participants in the treatment sample were more likely to report negative effects of use than the present sample. For example, 31% of the treatment sample reported psychological problems (anxiety, depression, psychosis/paranoia), in contrast 57% of the present sample reported that cannabis use never made them feel anxious, 65% never felt depressed while using cannabis, and 48% never became paranoid. These differences are presumably why the individuals in Copeland et al.'s sample were seeking treatment: the negative effects of use outweighed the positive.

Conclusions

The significant (and sometimes, substantial) associations between motives for cannabis use and subjective experiences of provide support for the mood-amplifying effects of cannabis. The findings also appear to confirm the dose-dependent nature of subjective experiences of use, with high intoxication explaining significant amounts of variance for all four subscales. Additionally, it is possible that tolerance to the effects of cannabinoids is important, with those participants who had longer histories of cannabis use being less likely to experience subjective effects of use. However, the latter could also be related to the lower levels of intoxication reported by the older participants (as noted in Chapter 6). Interestingly,

the physiological effects of cannabis use (e.g., bloodshot eyes, dry mouth/throat, the 'munchies'), which were reported by many participants, were negatively associated with age. This may also be due to the lower levels of intoxication reported by older participants, as both normal and highest levels of intoxication were significant associated with physiological effects subscale scores.

It is also interesting to note that negative experiences of use (psychopathological experiences: anxiety, depression, paranoia, suicidality), which were not reported by many participants, were associated with external influences motives (e.g., using to feel normal, to avoid withdrawal, feeling pressured to use), dependent use, and self-identified health issues. This pattern of associations would tend to suggest that cannabis use is problematic for the individuals reporting psychopathological experiences of use. In contrast, it appears that the participants experiencing perceptual changes (assessed with the altered reality subscale) and enhanced experiences (e.g. feeling happy, excited, uninhibited, laughing and talking more than normal) are primarily using cannabis socially. These participants have been using cannabis for shorter durations, are sensation seekers, and use cannabis for social/enhancement motives (e.g., because they enjoy it, to have fun and socialise, to relax and relieve boredom). The latter pattern of cannabis use does not appear to be problematic.

Thus, these findings indicate that, while the majority of the participants did not tend to experience negative subjective experiences of cannabis use, there is evidently a group of participants for whom cannabis use appears to be problematic. Further, it is apparent, from the findings discussed above, that the participants' differing life circumstances and patterns of cannabis use were associated with different motives for cannabis use and different subjective experiences of such use. These differences will be explored in more depth in Chapter 11, with the development of a cannabis user typology. However, first the relationships between cannabis use and everyday psychological wellbeing and cognitive function will be investigated, in Chapters 9 and 10 (respectively).

Cannabis Use Motives and Experiences Variables

A number of variables were described in this Chapter. Those that are utilised in future chapter are displayed in Table 8.12, while the descriptive statistics for these variables are provided in Appendix I25.

Table 8.12

Cannabis Use Motives and Experiences Variables

	Scoring Range	Score Interpretation
Motivations for Use Variables		
Self-medication subscale (α=.69)	0 – 12	Higher score = higher use of cannabis for self-medication purposes
Social/enhanced motives subscale (α=.74)	0 – 28	Higher score = higher use of cannabis for social/enhancement motives
External influences subscale (α=.64)	0 – 28	Higher score = higher use of cannabis due to external influences
Subjective Experience of Use Variables		
Altered reality subscale (α=.80)	0 – 32	Higher score = higher level of altered reality experiences of use
Psychopathological experience subscale (α=.72)	0 – 16	Higher score = higher level of psychopathological experiences of use
Enhanced experience subscale (α=.77)	0 – 28	Higher score = higher level of enhanced experiences of use
Physiological effects subscale (α=.70)	0 – 28	Higher score = higher level of physiological effects of use

CHAPTER 9

PSYCHOPATHOLOGY

Introduction

The third objective of the present study is to investigate: the nature of the association between cannabis use and previously reported adverse use-related issues; the likelihood of users experiencing these use-related issues; the severity with which they are experienced; and, the 'real word' impact of any adverse use-related issues on the ability of users to function in their daily lives. The use-related issues to be examined in the present study are centered on aspects of everyday psychopathological and cognitive functioning; the former will be investigated in the present chapter, while the latter is investigated in Chapter 10.

Comorbidity of Cannabis Use and Psychopathology

The US National Comorbidity Survey found that 90% of non-institutionalised people diagnosed with cannabis dependence had a comorbid psychiatric disorder (Agosti, Nunes, & Levin, 2002). Yet, the nature of the relationship between cannabis use and psychopathology is a contentious topic, with numerous hypothesized associations. These include: 1) a direct causal relationship, whereby cannabis use causes the development of later psychological disorders; 2) an indirect causal relationship, where cannabis use has an impact on another variable, which then leads to psychopathology; 3) no causal relationship, with risk factors common to both cannabis use and psychopathology causing both disorders independently; 4) self-medication, whereby individuals experiencing psychological disorders use cannabis to 'treat' their symptoms or side-effects; and, 5) a predisposition/vulnerability hypothesis, which proposes that cannabis use triggers psychological disorders in individuals with an

underlying vulnerability or predisposition for that disorder (Hunt, Lenton, & Witton, 2006; Teesson, Degenhardt, Proudfoot, Hall, & Lynskey, 2005).

Thus, the relationship between cannabis use and psychopathology is clearly not the same for all cannabis users. For example, of cannabis users with a comorbid psychiatric disorder in the US National Comorbidity Survey, 48% experienced a primary mood disorder, and 52% had a secondary mood disorder. Primary disorders were defined as those evident prior to symptoms of cannabis dependence, while secondary disorders were those that developed afterwards (Agosti et al., 2002). Therefore, approximately half of the participants developed cannabis dependency before the onset of a depression-related disorder, while the other half developed cannabis dependency after the onset of depression. In another study, 70% of 126 teenagers (aged 13-19 years) receiving treatment for comorbid major depression and substance use disorder were found to have experienced depression prior to the onset of substance use (Libby, Orton, Stover, & Riggs, 2005). Of these participants, 65% were diagnosed with cannabis dependence, in contrast to 41% of those experiencing the onset of a substance use disorder first (Libby et al., 2005).

Further, there appears to be a gender difference in the pattern of comorbidity seen in substance users. While males are more likely to experience substance use disorders than females, females are more likely to experience comorbid psychopathology, particularly mood and anxiety disorders (Milani, Parrott, Turner, & Fox, 2004; Zilberman, Tavares, Blume, & el-Guebaly, 2003). Additionally, males are reportedly more likely to develop depression after the onset of substance use, whereas females typically experience affective disorders before the onset of substance use (Brady, Grice, Dunstan, & Randall, 1993; Poulin, Hand, Boudreau, & Santor, 2005).

Age may also have an impact on the relationship between cannabis use and psychopathology. For example, in relation to suicidal behaviours, 14-15 year old cannabis users have been found to be more affected by regular cannabis use than 20-21 year old users,

although no age differences were evident in relation to depression (Fergusson, Horwood, & Swain-Campbell, 2002). Moreover, externalizing mental health issues have been found to lead to cannabis use during adolescence, with the causality reversed (i.e., cannabis use leading to externalizing mental health issues) in early adulthood (McGee, Williams, Poulton, & Moffitt, 2000).

Cannabis Use, Anxiety, and Depression

Links between cannabis use and depression have been studied by many researchers, although the relationship with anxiety has received significantly less investigation. This is interesting on a number of fronts including: the high level of comorbidity for anxiety and depression (e.g., Sartorius, Ustun, Lecrubier, & Wittchen, 1996); the existence of anxiety-related acute effects of cannabis use (e.g., Ashton, 2001); and, the antianxiety effects of cannabis (e.g., Sethi et al., 1986).

Much of the research assessing cannabis use and depression has been cross-sectional in design, with many studies of this type indicating a statistically significant relationship between the two variables. For example, cannabis use was found to be an independent cross-sectional predictor of depression for both male and female teenagers (mean age: 15.2 years) in a sample of 12,771 participants included in the 2002/2003 Student Drug Use Survey in the Atlantic Provinces (Poulin et al., 2005). While, Kelder et al. (2001) found that 42% of high school students (US grades 6-8) reporting lifetime cannabis use, also reported symptoms indicating major depression. These levels of depression were much higher than those found by Rey, Sawyer, Raphael, Patton and Lynskey (2002) in a study of 1261 participants, aged 13-17 years. In the latter study, 14% of males who had ever used cannabis met criteria for depression, in comparison to 6% of those who had never used it; the figures for females were 18% and 6%, respectively (Rey et al., 2002). Additionally, Gruber, Pope, Hudson, and Yurgelun-Todd (2003) found that 60% of current (n = 63) and 73% of former (n = 45)

heavy users of cannabis (>5000 lifetime uses of cannabis) reported that their cannabis use had a negative impact on their mental health.

However, Degenhardt, Hall, and Lynskey (2001) found that, after adjusting for demographics, neuroticism, and other drug use, cannabis use was not related to affective or anxiety disorders. This finding was based on a nationally representative sample of 10,641 participants surveyed as part of the Australian National Survey of Mental Health and Well-Being. Similarly, in a study of 302 suicide attempters and 1028 control subjects, 16% of attempters met DSM-III-R criteria for cannabis abuse/dependence compared to 2% of controls. Nevertheless, after controlling for socio-demographic factors, childhood factors and concurrent psychiatric morbidity, this relationship between cannabis use and suicide attempt was no longer statistically significant (Beautrais, Joyce, & Mulder, 1999). Finally, Denson and Earleywine (2006) found that non-users actually reported higher levels of depression than either weekly or daily cannabis users, in a study of 4,494 participants (mean age: 32.2 years).

Findings obtained from longitudinal studies also lack consistency. Brook, Brook, Zhang, Cohen and Whiteman (2002) found that early cannabis use predicted later major depressive disorder in a study of 736 participants interviewed at 14, 16, 22 and 27 years of age. This relationship remained significant after controlling for age, sex, parental education, family income, and prior episodes of major depression and substance use disorders (Brook et al., 2002). However, the finding was not supported by data from the Christchurch Health and Development Study, which involved 1265 children born in 1977, with data collected at birth, 4 months, 1 year, annually until 16 years, then again at 18, 21, and 25 years. After controlling for other variables (e.g., social, family, and childhood factors), early cannabis use no longer predicted later psychopathology (Fergusson & Horwood, 1997). Results from another New Zealand longitudinal study, the Dunedin Multidisciplinary Health and Development Study also found that cannabis use at 15 or 18 years of age did not predict later

anxiety or depression (Arseneault et al., 2002; McGee et al., 2000). The latter study involved 1037 children born in 1972-73, with data collected at 3 years and every two years thereafter until 15 years, then at 18, 21, 26 and 32 years of age.

The Christchurch Health and Development Study did, however find that weekly cannabis users were at an increased risk of depression, suicidal ideation, and suicide attempts (Fergusson et al., 2002). Similarly, Patton et al. (2002) found that weekly, or more frequent, cannabis use during adolescence was related to an increased risk for later depression and anxiety, particularly for females using daily. Furthermore, in the same sample of 1601, 14-15 year old high school students, experiencing depression did not predict later weekly or daily cannabis use (Patton et al., 2002). This finding was consistent with results from the Baltimore Epidemiologic Catchment Area Study, in which 1,920 adult participants were first assessed in 1980, and then followed-up between 1994 and 1996. In this study, participants who were diagnosed with depression at baseline (56%) were no more likely to receive a diagnosis of cannabis abuse at follow-up than non-depressed participants. However, participants diagnosed with cannabis abuse at baseline (4%) were four times more likely to be diagnosed with depression at follow-up than participants without cannabis abuse at baseline (Bovasso, 2001).

Degenhardt, Hall and Lynskey (2003a) recently completed a detailed review of this divergent literature. They encountered a number of difficulties in comparing past studies such as the variations in the measurement of depression; some studies used diagnostic criteria or symptom checklists, while others employed continuous measures of depression symptoms, sometimes with cut-off scores applied. The other major issue was the diverse measurement systems employed to assess cannabis use including varying classifications of use, abuse, and dependence, and levels of cannabis use in terms of frequency of consumption. However, they did not mention the need to quantify actual cannabis consumption. Frequency of use is not the same as quantity consumed, and both need to be

considered in relation to the dosage of cannabis. This is a particularly important qualification because the effects of cannabis are considered to be dose-dependent (Ashton, 2001).

After examining all of the evidence, Degenhardt et al. (2003a) concluded that there was a modest association between depression and heavy or problematic cannabis use, and between depression and early-onset, regular cannabis use. However, there was little evidence found for an association between depression and infrequent cannabis use; although the authors found that few studies statistically controlled for potentially confounding variables, thus suggestion that these associations may not be causal. Rather, both depression and cannabis use may arise as a result of common risk factors such as social, family, environmental, and/or individual factors.

Cannabis Use and Psychosis

There is a vast body of research examining associations between cannabis use and psychotic disorders; nevertheless there is much contention about the nature of this relationship. For example, some studies have found that cannabis use is both predicted by, and an outcome of, psychotic disorders (e.g., Ferdinand, Sondeijker et al., 2005; van Os et al., 2002). Alternatively, epidemiological data indicates that population levels of cannabis use have increased dramatically in recent decades, but that incidence rates for psychotic disorders have not (e.g., Degenhardt, Hall, & Lynskey, 2003b). Further, there is a noticeable lack of statistical control for potentially confounding factors in many studies (e.g., Degenhardt, 2003). In spite of this, numerous reviews of the cannabis-psychosis literature support the hypotheses that cannabis use precipitates psychotic disorders in individuals with an underlying vulnerability, and/or exacerbates symptoms in individuals with pre-existing conditions, although it is not clear if this relationship is direct or indirect (Arseneault, Cannon, Witton, & Murray, 2004; Degenhardt, 2003; Degenhardt & Hall, 2006; Fergusson, Poulton, Smith, & Boden, 2006; Hall, 1998; Hall, Degenhardt, & Teesson, 2004; Henquet,

Murray, Linszen, & van Os, 2005; Semple, McIntosh, & Lawrie, 2005; Smit, Bolier, & Cuijpers, 2004; Verdoux, Tournier, & Cougnard, 2005). The majority of these reviews do however indicate that there is a lack of strong evidence supporting a direct causal relationship between cannabis use and psychosis in individuals without a preexisting vulnerability for such disorders.

In the present study, the relationship between cannabis use and psychotic disorders was not specifically evaluated. While schizotypal traits were assessed, participants reporting a diagnosis of psychosis or schizophrenia were excluded from all analyses because their diagnoses could not be verified. Therefore, the literature discussed below is restricted to the relationship between cannabis use and psychotic symptoms in non-clinical populations.

In the Christchurch Health and Development Study, information related to cannabis use and psychotic symptoms was collected from 1,055 participants at 18, 21, and 25 years of age (Fergusson, Horwood, & Ridder, 2005). After controlling for confounding factors, a dose-response relationship was still evident between frequency of cannabis use and rates of psychotic symptoms, with daily cannabis users found to have rates of psychotic symptoms 1.6-1.8 times higher than non-users. However, within the cannabis user group, psychotic symptomology was found to be negatively associated with cannabis use, such that increasing symptoms were associated with decreased cannabis use. On this basis, the authors concluded that cannabis use had caused the psychotic symptoms (Fergusson et al., 2005).

Similarly, Ferdinand, van der Ende et al. (2005) found cannabis use to be a predictor of later psychotic symptoms, although, in contrast to Fergusson et al, they found that psychotic symptoms also predicted later cannabis use. These latter results were based on data from a 14-year follow-up study of 1,580 Dutch adolescents (initially aged 4-16 year old), of whom 23% of had previously used cannabis, with 83% reporting no psychotic symptoms. Psychotic symptoms were reported by 10% of all participants, of whom 62% had never used cannabis, 15% had experienced psychotic symptoms prior to initiating cannabis use, 19%

had used cannabis before the onset of psychotic symptoms, and 4% had experienced symptoms at the same age as cannabis use was initiated (Ferdinand, van der Ende et al., 2005). However, the proportion of participants who had experienced psychotic symptoms prior to initiating cannabis use was much higher in a study of 189 undergraduate college students (mean age: 21.7 years) (Schiffman, Nakamura, Earleywine, & LaBrie, 2005). In this study, 70% of recent cannabis users who reported schizotypal symptoms had experienced these symptoms prior to the initiation of cannabis use. Additionally, recent cannabis users (i.e., those who consumed cannabis in the last 90 days) scored significantly higher on subscales measuring cognitive and perceptual distortions, and disorganization, but not interpersonal deficits, compared to nonusers and non-recent users (Schiffman et al., 2005).

Dumas et al. (2002) examined the relationship between cannabis use and psychotic symptoms in 232 participants, aged 18-25 years (mean age: 21.2 years). The majority of these participants (54%) had never used cannabis, 28% were past or occasional users (less than twice per week), while 18% of participants were classified as regular users (consumed cannabis at least twice a week). After adjusting for gender, depression, and anxiety, significant differences were evident between nonusers and regular users for 5 of the 14 scales, including the Magical Ideation Scale (from Chapman's Psychosis Proneness Scales), the total Schizotypal Personality Questionnaire (SPQ) score, and 3 of the SPQ subscales: Ideas of Reference, Unusual Perceptual Experiences, and Odd or Eccentric Behaviour. These findings differ somewhat from those of Mass, Bardon, Kindl and Dahme (2001), who also employed the SPQ, but only one of the Psychosis Proneness Scales (Perceptual Aberrations Scale). Twenty participants who had consumed cannabis in the previous month scored higher on all scales than the 20 nonusers, with the only significant differences indicated for Perceptual Aberrations and the SPQ subscale, Odd or Eccentric Behaviour; but this may have been due to the small sample size. Similar mixed results were evident in a study of 8,520 participants, aged 16-74 years, completed by Johns et al. (2004). They found that cannabis

dependence was a significant predictor of psychotic symptoms, but not paranoid thoughts or hallucinatory experiences, two common psychotic symptoms. However, only a small number (6%) of the participants endorsed one or more psychotic symptom, and an even smaller proportion (2.5%) were classified as being dependent cannabis users.

Cannabis use was found to have a significant positive association with both positive and negative psychotic symptoms in a study of a representative sample of 3,500, 19 year olds from Greece (Stefanis et al., 2004). This association between cannabis use and psychotic symptoms was found to be strongest for the 26% of cannabis users who initiated use prior to 16 years of age. This early use-related finding is consistent with those from the Dunedin Multidisciplinary Health and Development Study (Arseneault et al., 2002). They found that participants who had used cannabis three or more times by the age of 15 (4%) or 18 years (31%) reported significantly more symptoms of schizophrenia at 26 years of age than participants who had either never used cannabis or only used it once or twice (65%). This effect was strongest for those participants who had consumed cannabis three of more times by 15 years of age, and the association was still significant after adjustment for psychotic symptoms evident at 11 years of age (Arseneault et al., 2002). However, it is not clear if these putative effects are direct or indirect.

Summary

Comorbidity of cannabis use and psychopathology is relatively common in the general population, yet no definitive conclusions have been reached regarding the association between these factors. Some individuals apparently experience psychopathological symptoms prior to the onset of cannabis use, while others experience them afterwards, suggesting that different groups of cannabis users may arrive at this comorbidity via differing pathways. For example, a common risk factor (e.g., a history of abuse) may lead to psychopathology and cannabis use for some individuals, while for others, cannabis may be used to self-medicate a

preexisting condition (e.g., depression), and psychopathology may be triggered by cannabis use in vulnerable individuals.

Nevertheless, two strong themes are apparent in the research that has examined this association. That is, there appears to be an increased risk of adverse psychological outcomes for individuals who initiate cannabis use prior to 16 years of age, and/or those who consume cannabis frequently, particularly on a daily or near daily basis. However, findings from the present study (see Chapters 5 & 7) suggest that early cannabis use is just one part of a broader pattern of externalising behaviours, with the continuation of substance use (i.e., tobacco and poly-substance use) beyond adolescence and socialising with other cannabis users related to subsequent peak levels of cannabis use (i.e., daily use). Thus, previously reported use-related psychopathology may be associated with this pattern of externalising behaviour rather than the related patterns of cannabis use. Further, as findings from the present study (see Chapter 5) indicate that delinquent behaviour is associated with exposure to adverse circumstances during childhood, and these life circumstances have also been linked by other researchers to later psychopathology, it is possible that the association between (potentially) problematic patterns of cannabis use and psychopathology is due to adverse childhood circumstances being a common underlying risk factor. Hence, there may be no direct association between cannabis use and psychopathology, with both conditions stemming relatively independently from adverse childhood circumstances. This premise will be investigated in the present chapter.

The first section of this chapter will focus on the psychological distress and wellbeing experienced by the participants, while the second section will examine the psychotic symptomology reported by the participants. Both of these sections will initially examine the level of psychopathology experienced by the participants, and the severity with which it is experienced. This will be followed by a determination of the likelihood of the participants experiencing psychopathology, before an examination of the nature of the

associations between psychopathology and cannabis use factors. While investigating these associations, it will be necessary to account for many potentially confounding factors. The latter factors may include demographic data and lifestyle factors, co-morbid drug and alcohol use, and pre-existing mental health problems. The final section of the present chapter provides a summary of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample population in context, both in relation to cannabis-using populations and the general population.

Psychological Distress and Wellbeing

The Mental Health Inventory (MHI)

The 18-item version of the MHI (MHI-18), a general population self-report measure of mental health, was used to assess psychological distress and wellbeing in the present study (Ware, Manning, Duan, Wells, & Newhouse, 1984). MHI items include a description of a particular symptom or state of mind, with the participant indicating the degree to which they have experienced this state in the past month. All items are rated on a 6-point scale, from 'all of the time' to 'none of the time' (Ware et al., 1984).

The MHI-18 has two domains. The psychological distress domain consists of 13 items and contains three subscales: anxiety (5 items), depression (4 items), and loss of behavioural and emotional control (4 items). The psychological wellbeing domain consists of 5 items and contains one subscale, general positive affect (4 items) plus one additional item. An overall index score can also be calculated, taking both psychological distress and wellbeing scores into account. This index score, the two domain scores, and all four subscale scores are calculated in such a way that the final scores are out of 100. Although these scales were all originally designed so that higher scores indicated greater wellbeing, the scoring has been altered to be more intuitive, with higher scores on the psychological distress domain and subscales indicating higher levels of distress, anxiety, depression, and loss of behavioural

and emotional control, as relevant (Stewart et al., 1992). Unfortunately, there are no clinical cut-off scores provided for the MHI-18.

The MHI-18 has been found to be valid and reliable: MHI index, $\alpha = .96$; anxiety subscale, $\alpha = .88$; depression subscale, $\alpha = .89$; loss of behavioural and emotional control subscale, $\alpha = .85$ (Ware et al., 1984). Moreover, McHorney, Ware, Rogers, Raczek, and Lu (1992) found the MHI-18 had a very high level of precision in separating medical and psychiatric patients (.95 - .99). The MHI-18 was found to have good internal consistency reliability, based on the data from participants in the present study ($N = 989$), for both domains (psychological distress, $\alpha = .92$; psychological wellbeing, $\alpha = .82$) and all subscales (anxiety, $\alpha = .83$; depression, $\alpha = .87$; loss of behavioural and emotional control, $\alpha = .81$; positive affect, $\alpha = .83$).

Levels of Psychological Distress & Wellbeing.

MHI-18 Index

The mean MHI-18 index score for the participants ($N = 989$) was 67.97 ($SD = 16.58$). A two-way ANOVA indicated a small gender effect, with males ($M = 69.71$, $SD = 15.61$) reporting significantly higher levels of psychological health than females ($M = 65.09$, $SD = 17.71$): $F(1, 988) = 17.24$, $p < .001$, $\eta^2 = .017$. There were no significant age effects or interactions indicated (see Appendices J1 & J2).

Psychological Distress

Psychological Distress Domain. The mean psychological distress domain score for the participants ($N = 989$) was 49.08 ($SD = 9.39$). A two-way ANOVA indicated a small age effect: $F(4, 988) = 3.65$, $p = .006$, $\eta^2 = .015$. However, no gender effects or interactions were indicated (see Appendices J3 & J4). A post hoc Tukey's HSD analysis indicated that participants aged in their teens ($M = 50.86$, $SD = 9.65$) reported significantly higher levels of

psychological distress than the participants who were over 40 years of age (M = 46.71, SD = 8.54), and there was an overall trend for psychological distress to decrease with increasing age (see Appendix J5).

Anxiety Subscale. The mean anxiety subscale score for the participants (N = 989) was 50.34 (SD = 12.08). A two-way ANOVA indicated no significant age, gender, or interaction effects (see Appendices J6 & J7).

Depression Subscale. The mean depression subscale score for the participants (N = 989) was 41.68 (SD = 15.75). A two-way ANOVA indicated a small gender effect, with females (M = 44.35, SD = 16.96) reporting significantly higher levels of depression than males (M = 40.07, SD = 14.76): $F(1, 988) = 15.98$, $p < .001$, $\eta^2 = .016$. There were no significant age effects or interactions indicated (see Appendices J8 & J9).

Loss of Behavioural and Emotional Control Subscale. The mean loss of behavioural/ emotional control subscale score for the participants (N = 989) was 54.94 (SD = 9.16). A two-way ANOVA indicated a small gender effect, with males (M = 55.68, SD = 9.20) reporting significantly greater loss of behavioural/emotional control than females (M = 53.72, SD = 8.99): $F(1, 988) = 10.04$, $p = .002$, $\eta^2 = .010$. There were no significant age effects or interactions indicated (see Appendices J10 & J11).

Psychological Wellbeing

Psychological Wellbeing Domain. The mean psychological wellbeing domain score for the participants (N = 989) was 69.60 (SD = 14.98). A two-way ANOVA indicated a no significant age, gender, or interaction effects (see Appendices J12 & J13).

Positive Affect Subscale. The mean positive affect subscale score for the participants (N = 989) was 69.43 (SD = 15.07). A two-way ANOVA indicated a small gender effect, with males (M = 70.68, SD = 14.35) reporting significantly higher levels of positive affect than

females (M = 67.36, SD = 16.00): $F(1, 988) = 11.13$, $p = .001$, $\eta^2 = .011$. There were no significant age effects or interactions indicated (see Appendices J14 & J15).

Figure 9.1 provides a visual comparison of the participants' mean domain and subscale score. It is evident in this figure that the participants reported higher levels of psychological wellbeing than psychological distress. Furthermore, of the subscales contributing to the psychological distress domain, participants were most likely to have reported experiencing a loss of behavioural and emotional control (e.g., feeling emotionally unstable; having difficulty controlling thoughts, emotions, and feelings). The participants were a little less likely to have reported experiencing anxiety symptomology (e.g., having difficulty relaxing; feeling anxious or worried), and were least likely to report experiencing symptoms of depression (e.g., being in low or very low spirits; being moody or brooding about things).

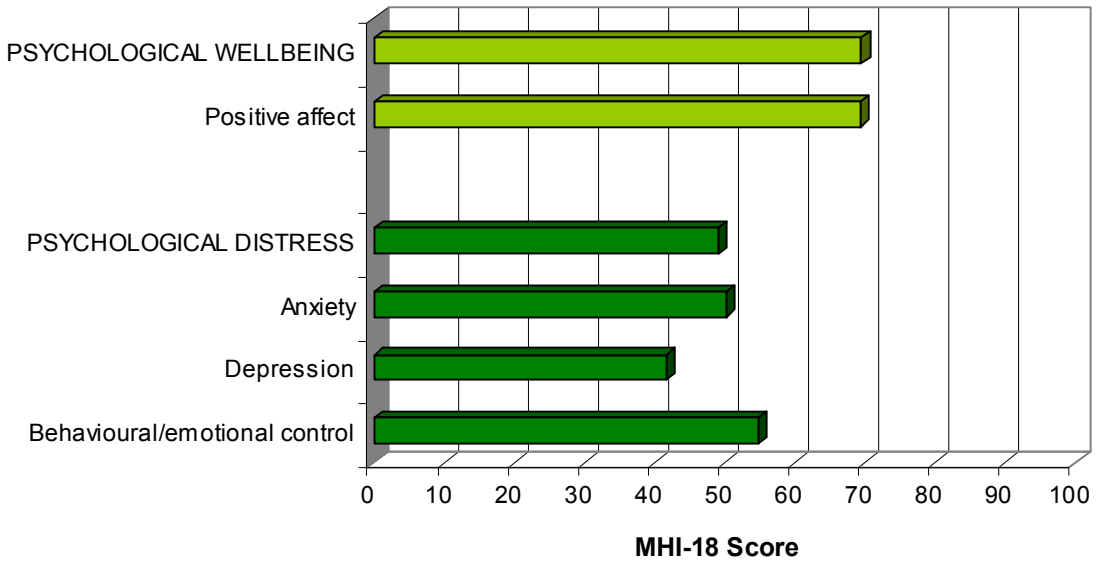

Figure 9.1. Mean MHI-18 domain and subscale scores

Severity of Psychological Distress

The MHI-18 has been used infrequently in studies, with researchers and health clinicians more likely to choose the shorter MHI-5 (Berwick, Murphy, Goldman, & Ware, 1991). All five of the MHI-5 items are included in the MHI-18, with two from the anxiety subscale, and one item from each of the depression, loss of behavioural/emotional control, and positive affect subscales. As for the MHI-18, an index score is calculated (range: 0-100), whereby higher scores indicate greater psychological wellbeing.

General Population Data

The MHI-5, as part of the SF-36, was included in the 1995 Australian *National Health Survey* (ABS, 1995), with the resulting data (*N* = 18, 202) used to develop Australian norms. These general population age and gender norms were compared to data from the present study using Coe's Effect Size Calculator (2006). This comparative procedure indicated that the present sample did not differ significantly from the Australian population in relation to the participants' mean level of psychological distress (see Figure 9.2 and Appendix J16).

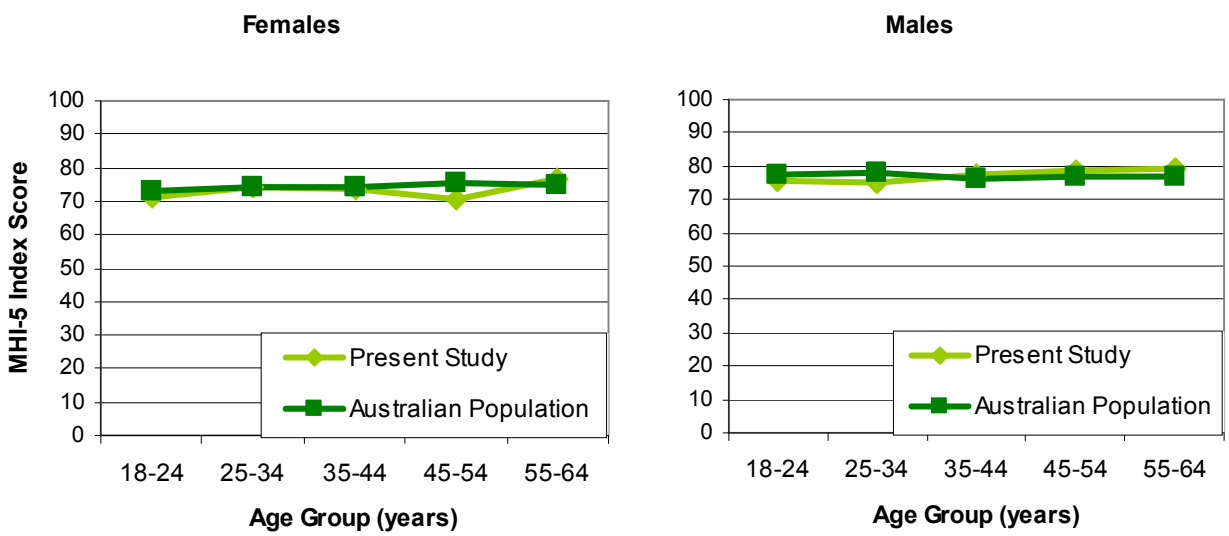

Figure 9.2. Comparison of participants' MHI-5 index scores with Australian norms

Clinical Cut-Off Points

The MHI-5 was designed as a screening test rather than a diagnostic tool, hence no clinical cut-off was specifically designated. This has lead many investigations to determine clinically valid cut-off scores. These studies have typically employed Receiver Operating Characteristic (ROC) curves with the General Health Questionnaire (GHQ) as the comparison measure (e.g., Berwick et al., 1991; Kelly, Dunstan, Lloyd, & Fone, 2008), although, other comparison measures have been utilised, such as the Symptom Checklist (Strand, Dalgard, Tambs, & Rognerud, 2003), the Zung Self-rating Depression Scale (Yamazaki, Fukuhara, & Green, 2005), and the Composite International Diagnostic Interview (Rumpf, Meyer, Hapke, & John, 2001). Unsurprisingly, the resulting cut-off scores have also differed. However there appears to be some consensus that a score of 52 or lower is appropriate for identifying severely depressed individuals (Berwick et al., 1991; Bultmann et al., 2006; Ostbye, Steenhuis, Walton, & Cairney, 2000; Yamazaki et al., 2005), while a cut-off of 60 has been suggested for identifying moderate depression/mood disorders (Rumpf et al., 2001; Yamazaki et al., 2005), a cut-off score of 68 has proposed for assessing mild depression (Yamazaki et al., 2005), and a cut-off of 70 has been suggested as being appropriate for identifying individuals with anxiety disorders (Rumpf et al., 2001).

Kelly et al. (2008) used data from Wave 9 of the *British Household Panel Survey* (N = 14,669) to determine a clinically valid MHI-5 cut-off scores for identifying cases of common mental disorder (anxiety and depression). Using the GHQ as the comparison measure, the researchers employed ROC curves to investigate five different methods for cut-off score identification: the Youden Index; the point closest to the upper left corner, coordinates (0,1); the misclassification rate; the minimax method; and, prevalence matching. The misclassification rate method provided a cut-off of 60, while the minimax and prevalence matching methods both indicated a cut-off of 68, and the Youden Index and (0,1) methods both identified a cut-off score of 76.

For the present study, it was decided that three of these cut-off scores would be utilised to classify the participants. Hence: a MHI-5 score of 52 or less was classified as severe depression; a score between 53 and 60 as moderate depression, a score between 61 and 68 as mild depression, and a score of 69 or over was classified as not depressed. Using this classification procedure, 28% of participants were classified with some level of depression (see Table 9.1).

Table 9.1
MHI-5 Depression Groups

	Female		**Male**		**All**	
	N	%	*N*	%	*N*	%
Not depressed	246	66.1	469	76.0	715	72.3
Mild depression	39	10.5	51	8.3	90	9.1
Moderate depression	42	11.3	50	8.1	92	9.3
Severe depression	45	12.1	47	4.8	92	9.3

Comparison with Clinical Groups

To determine if these MHI-5 depression groups were similar to other clinical groups, mean MHI-5 scores were compared with the reported norms for depressed individuals from 1995 Australian *National Health Survey* (ABS, 1995) and the *Medical Outcomes Study* (Hays & Mazel, 1995) using Coe's Effect Size Calculator (2006). This comparative procedure indicated that the mild depression group was statistically equivalent to Hays and Mazel's subthreshold depression group, while being significantly different from their major depression and dysthymia groups, and the Australian depression group. The moderate depression group was statistically equivalent to Hays and Mazel's major depression group and the Australian depressed group, while being significantly different from Hays and Mazel's subthreshold depression and dysthymia groups. Furthermore, the severe depression

group was statistically equivalent to Hays and Mazel's dysthymia group, while being significantly different from their subthreshold and major depression groups (see Figure 9.3 and Appendix J17).

To summarise, the mild depression classification in the present study appears to be tapping subthreshold levels of depression, while the moderate depression classification is equivalent to major depression, and the severe depression classification corresponds to dysthymia. On this basis, the mild depression group was discarded, with the relevant participants reclassified as non-depressed. Thus, 19% of participants were classified as depressed, which was 23% of female and 16% of male participants.

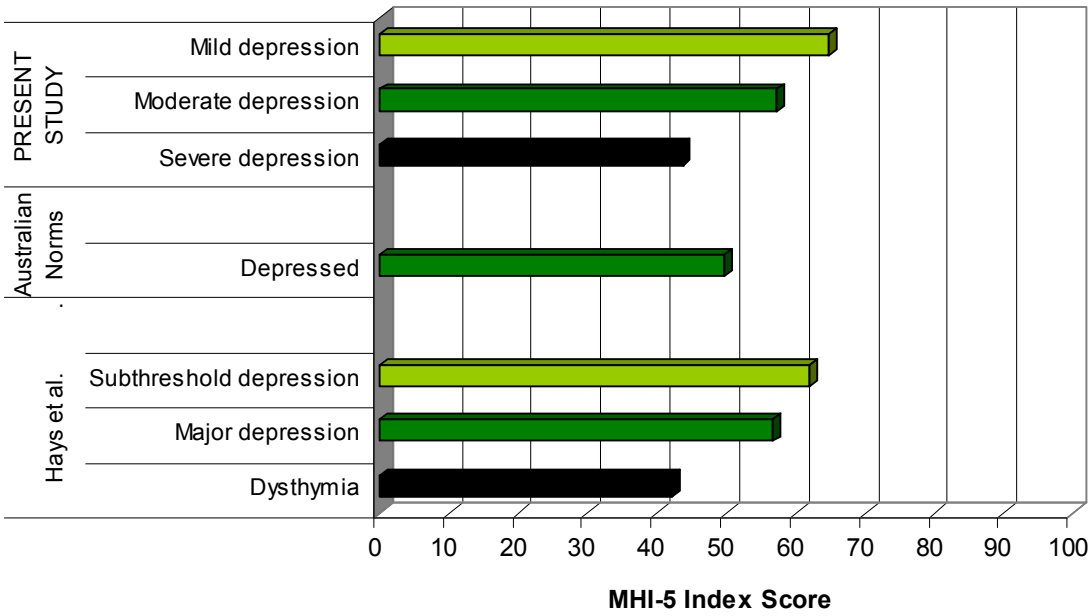

Figure 9.3. Comparison of MHI-5 index scores for present sample and clinical samples (same colour = not statistically different)

Likelihood of Experiencing Depression

Odds ratios were calculated to determine which lifestyle and cannabis use factors placed participants at a high level of risk for experiencing depression (see Table 9.2). For these analyses, participants were categorised into two groups; those who were classified as with some level of depression (n = 184; 'depressed' = 1), and those who were not depressed (n = 805; 'not depressed' = 2). Dichotomised lifestyle and cannabis use factors are listed in Appendix J18.

It is clear in Table 9.2 that the individuals meeting proxy cannabis dependence criteria were at a higher level of risk of also experiencing depression than individuals who were not classified as being dependent. However, early cannabis use, prolonged duration of use, and daily cannabis use, were not found to be associated with elevated risk levels for experiencing depression. The individuals who were most likely to experience depression were single, unemployed, with low proxy SES, who reported both health and sleep problems. In childhood they had experienced psychopathology and did not have an adult who they could turn to for help or support when needed. While the associations were weaker, female gender, low level of educational attainment, high tobacco use and delinquent behaviour during childhood were also indicated as factors related to elevated levels of psychological distress.

Table 9.2
Participants Meeting Risk Factor Criteria and Odds Ratio for Depression

	Depressed (*N* = 184)		**Not depressed** (*N* = 805)			
	N	%	*N*	%	**OR**	**95% CI**
Key Cannabis Use Factors						
Early use	83	45.1 %	314	39.0 %	1.29	0.93 - 1.78
Daily use	123	66.8 %	537	66.7 %	1.01	0.72 - 1.41
Prolonged use	63	39.9 %	341	48.1 %	0.72	0.50 - 1.02
Dependent use	40	21.7 %	87	10.8 %	2.29 ***	1.51 - 3.47
Current Lifestyle Factors						
Demographic & Environmental						
Female	87	47.3 %	285	35.4 %	1.64 **	1.18 - 2.26
Young	86	46.7 %	320	39.6 %	1.33	0.96 - 1.84
Single	132	71.7 %	446	55.4 %	2.04 ***	1.44 - 2.90
Unemployed	48	26.1 %	101	12.5 %	2.46 ***	1.67 - 3.63
Low SES (self)	153	83.2 %	573	71.2 %	2.00 ***	1.32 - 3.03
Low education	67	36.4 %	206	25.6 %	1.67 **	1.19 - 2.34
Urban	39	21.2 %	238	29.6 %	0.64 *	0.44 - 0.94
Friends use cannabis	104	56.5 %	477	59.3 %	0.89	0.65 - 1.24
Individual						
High alcohol use	17	9.2 %	92	11.4 %	0.79	0.46 - 1.36
High tobacco use	100	54.3 %	327	40.6 %	1.74 **	1.26 - 2.40
Poly-substance use	97	52.7 %	353	43.9 %	1.43 *	1.04 - 1.97
High sensation seeking	54	29.3 %	248	30.6 %	0.94	0.67 - 1.34
Poor health	115	62.5 %	278	34.5 %	3.16 ***	2.27 - 4.40
Sleep problems	129	70.1 %	330	41.0 %	3.38 ***	2.39 - 4.77
Childhood Lifestyle Factors						
Environmental						
Sole parent	50	27.2 %	171	21.2 %	1.38	0.96 - 2.00
Low SES (parental)	72	39.1 %	280	34.8 %	1.21	0.87 - 1.68
Family addiction	113	61.4 %	438	54.5 %	1.33	0.96 - 1.84
High conflict	32	17.8 %	146	18.4 %	0.96	0.63 - 1.46
Domestic violence	82	44.6 %	363	45.1 %	0.98	0.71 - 1.35
Death of someone close	71	38.6 %	245	30.4 %	1.44 *	1.03 - 2.00
Physical abuse	50	28.6 %	185	23.7 %	1.29	0.89 - 1.86

Table 9.2 continued

	Depressed (*N* = 184)		**Not depressed** (*N* = 804)			
	N	%	*N*	%	**OR**	**95% CI**
Sexual abuse	30	17.4 %	111	14.3 %	1.27	0.82 - 1.98
No adult support	112	60.9 %	297	36.9 %	2.66 ***	1.92- 3.70
Individual						
Early tobacco use	132	71.7 %	533	66.2 %	1.30	0.91 - 1.84
Early alcoho/ use	88	47.8 %	379	47.1 %	1.03	0.75 - 1.42
Early substance use	29	15.8 %	92	11.4 %	1.45	0.92 - 2.28
High delinquent behaviour	73	39.7 %	235	29.2 %	1.60 **	1.14 - 2.24
Ran away from home	64	34.8 %	212	26.3 %	1.49 *	1.06 - 2.10
Childhood psychopathology	127	69.8 %	55	43.2 %	3.04 ***	2.15 - 4.30
ADD/ADHD	32	17.7 %	127	15.9 %	1.14	0.74 - 1.74

* $p < .05$, ** $p < .01$, *** $p < .001$

Factors Associated with Psychological Distress

As a further step towards understanding the nature of the association between cannabis use and psychological distress preliminary correlation analyses were completed between the cannabis use factors and the MHI-18 depression and anxiety subscale scores. Correlation analyses were also completed between these subscales and both childhood and current lifestyle factors to identify potentially confounding variables (see Appendix J19). Variables found to be significantly associated with the anxiety and depression subscales were then entered into stepwise multiple regression analyses. For each of the subscales four initial multiple regression analyses were completed; one each for cannabis use factors, childhood lifestyle factors, and current lifestyle factors, with the fourth multiple regression containing the variables that were significantly indicated in the prior analyses as being associated with the subscales. A final multiple regression contained the key variables indicated in the fourth

multiple regression and associated motives for cannabis use and subjective experiences of cannabis use to determine the role played by these aspects of cannabis use. Due to the large amount of co-morbidity between depression and anxiety, the MHI-18 anxiety subscale was also entered into the final regression analysis investigating depression scores, while the MHI-18 depression subscale was entered into the final anxiety regression analysis.

Depression Subscale

The first stepwise multiple regression analysis, investigating associations between depression scores and cannabis use factors, included nine variables: duration of use, proxy dependence, number of proxy dependence criteria, solitary use, proportion of cannabis in cones/joints, strength of cones/joints, concurrent tobacco use, and normal and highest levels of intoxication. The three variables retained in the final regression model (number of proxy dependence criteria, highest level of intoxication, and strength of cones/joints), only explained 7% of the variance in depression subscale scores: $F(3, 745) = 18.01$, $p < .001$ (see Table 9.3 and Appendix J20). The second and third stepwise multiple regression analyses, investigating associations with current and childhood lifestyle factors (respectively), identified five current (gender, single marital status, frequency of tobacco use, and sleep and health problems) and two childhood (psychopathology and lack of adult support) lifestyle factors as potential confounds (see Table 9.3 and Appendix J20).

The fourth stepwise multiple regression analysis contained all 10 of the variables identified through the previous analyses as being significantly associated with depression subscale scores. Eight of these variables were retained in the final regression model, explaining 22% of the variance in depression subscale scores: $F(8, 749) = 26.71$, $p < .001$ (see Table 9.3 and Appendix J20). Of the two cannabis use variables retained in the final regression model, the number of proxy dependence criteria endorsed by participants explained the highest proportion of variance in MHI-18 depression subscale scores.

Table 9.3
Final Multiple Regression Models for Depression Subscale Scores

	B	*SE B*	β	*t*	*p*	sr^2
Cannabis Use Factors (*Adj.* R^2 = .064)						
No. of proxy dependence criteria	2.01	0.37	0.20	5.37	<.001	.036
Strength of cones/joints	- 0.31	0.11	- 0.10	- 2.88	.004	.010
Highest level of intoxication	1.41	0.54	0.09	2.62	.009	.009
Current Lifestyle Factors (*Adj.* R^2 = .135)						
Sleep problems	3.80	0.53	0.23	7.16	<.001	.045
Single marital status	5.47	0.95	0.17	5.76	<.001	.029
Gender	- 3.40	0.97	- 0.11	- 3.50	<.001	.011
Health problems	1.53	0.44	0.11	3.47	.001	.011
Tobacco use	0.59	0.21	0.08	2.77	.006	.006
Childhood Lifestyle Factors (*Adj.* R^2 = .110)						
Childhood psychopathology	4.18	0.48	0.27	8.72	<.001	.069
Lack of adult support	1.57	0.35	0.14	4.47	<.001	.018
Family addiction problems	1.03	0.40	0.08	2.59	.010	.006
Fourth Regression Model (*Adj.* R^2 = .215)						
Childhood psychopathology	3.21	0.56	0.21	5.78	<.001	.035
Single marital status	5.00	1.05	0.16	4.76	<.001	.023
No. of proxy dependence criteria	1.60	0.34	0.16	4.68	<.001	.023
Lack of adult support	1.27	0.39	0.11	3.28	.001	.011
Strength on cones/joints	- 0.31	0.10	- 0.10	- 3.10	.002	.010
Sleep problems	1.79	0.61	0.11	2.94	.003	.009
Health problems	1.42	0.49	0.11	2.89	.004	.009
Gender	- 3.03	1.12	- 0.09	- 2.71	.007	.007
Motive & Experience Factors (*Adj.* R^2 = .211)						
Psychopathological experiences	2.35	0.23	0.35	10.33	<.001	.116
Self-Medication motives	1.36	0.18	0.26	7.70	<.001	.065
Final Regression Model (*Adj.* R^2 = .455)						
MHI-18 anxiety subscale	0.62	0.04	0.48	15.65	<.001	.176
Self-medication motives	0.81	0.15	0.15	5.26	<.001	.020
Psychopathological experiences	0.99	0.20	0.15	4.89	<.001	.017
Child psychopathology	1.87	0.44	0.12	4.23	<.001	.013
Single marital status	2.62	0.87	0.08	3.01	.003	.007
Lack of adult support	0.92	0.32	0.08	2.88	.004	.006

However, childhood psychopathology explained a higher proportion of the variance in depression scores than the proportion explained by the number of proxy dependence criteria endorsed by the participants. Thus, indicating that pre-existing mental health issues are more strongly associated with current depression levels than any cannabis use factors. Further, no cannabis use factors were retained in the final model of the final multiple regression analyses after self-medication motives for use, psychopathological subjective experiences, and MHI-18 anxiety subscale scores were included (see Table 9.3 and Appendix J20). Rather, anxiety levels accounted for the highest proportion of variance in depression scores, with self-medication motives, psychopathological subjective experiences, childhood psychopathology, single marital status, and a lack of adult support during childhood, also adding to the 46% of depression score variance explained by the variables.

Anxiety Subscale

The first stepwise multiple regression analysis, investigating associations between anxiety scores and cannabis use factors, included 10 variables: duration of use, proxy dependence, number of proxy dependence criteria, solitary use, number of cones/week, proportion of cannabis in cones/joints, strength of cones/joints, concurrent tobacco use, and normal and highest levels of intoxication. The three variables retained in the final regression model (number of proxy dependence criteria, strength of cones/joints, and normal level of intoxication) only explained 6% of the variance in anxiety subscale scores: $F(3, 723) = 17.15$, $p < .001$ (see Table 9.4 and Appendix J20).

The second and third stepwise multiple regression analyses, investigating associations with current and childhood lifestyle factors (respectively), identified three current (age group, and sleep and health problems), and one childhood (psychopathology) lifestyle factors as potential confounds (see Table 9.4 and Appendix J20). The fourth stepwise multiple regression analysis contained all seven of the variables identified through the previous

analyses as being significantly associated with anxiety subscale scores. Five of these variables were retained in the final regression model, explaining 14% of the variance in anxiety subscale scores: $F(5, 751) = 26.32$, $p < .001$ (see Table 9.4 and Appendix J20).

Table 9.4
Final Multiple Regression on Anxiety Subscale Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Cannabis Use Factors (*Adj.* $R^2 = .063$)						
No. of proxy dependence criteria	1.44	0.29	0.18	5.01	<.001	.033
Normal level of intoxication	1.16	0.38	0.11	3.03	.003	.012
Strength of cones/joints	- 0.25	0.09	- 0.11	- 2.94	.003	.011
Current Lifestyle Factors (*Adj.* $R^2 = .080$)						
Health problems	1.75	0.35	0.17	4.99	<.001	.023
Sleep problems	1.94	0.42	0.15	4.63	<.001	.020
Age group	- 1.12	0.27	- 0.13	- 4.15	.010	.016
Childhood Lifestyle Factors (*Adj.* $R^2 = .064$)						
Childhood psychopathology	3.06	0.37	0.26	8.23	<.001	.065
Fourth Regression Model (*Adj.* $R^2 = .144$)						
Childhood psychopathology	2.92	0.43	0.19	5.37	<.001	.033
Health issues	1.81	0.37	0.17	4.85	<.001	.027
No. of proxy dependence criteria	1.25	0.27	0.16	4.56	<.001	.024
Strength of cones/joints	- 0.30	0.08	- 0.13	- 3.71	<.001	.016
Normal level of intoxication	1.03	0.36	0.10	2.82	.005	.009
Motive & Experience Factors (*Adj.* $R^2 = .177$)						
Psychopathological experiences	1.91	0.18	0.37	10.86	<.001	.130
Self-medication motives	0.68	0.14	0.17	4.91	<.001	.027
Final Regression Model (*Adj.* $R^2 = .407$)						
MHI-18 depression subscale	0.39	0.02	0.51	16.28	<.001	.213
Psychopathological experiences	0.98	0.16	0.19	6.12	<.001	.030
Health problems	0.96	0.30	0.09	3.17	.002	.008

Of the three cannabis use variables retained in the final regression model of the fourth analysis, the number of proxy dependence criteria endorsed by participants explained the highest proportion of variance in MHI-18 anxiety subscale scores. However, childhood psychopathology and health problems were both responsible for explaining a higher proportion of the variance in anxiety scores than the number of proxy dependence criteria endorsed by the participants. Thus, indicating that pre-existing mental health issues and current physical health problems are more strongly associated with current anxiety levels than any cannabis use factors. Further, no cannabis use factors were retained in the final model of the final multiple regression analyses after self-medication motives for use, psychopathological subjective experiences, and MHI-18 depression subscale scores were included (see Table 9.4 and Appendix J20). Rather, depression levels accounted for the highest proportion of variance in anxiety scores, with psychopathological subjective experiences and self-identified health issues also adding to the 41% of anxiety score variance explained by the three variables.

In summary, cannabis use factors explained small amounts of the variance in MHI-18 depression (6.4%) and anxiety (6.3%) subscale scores, but explained less variance than current lifestyle factors (depression, 13.5%; anxiety, 8.0%) and childhood lifestyle factors (depression, 11.0%; anxiety, 6.4%). When lifestyle factors were included in the regression analyses with the cannabis use factors, the number of dependence criteria endorsed by participants, the strength of cones/joints, and for anxiety, normal level of intoxication, continued to be significantly associated with the psychological distress variables. However, after the addition of self-medication motives for use, psychopathological experience of use, and the alternate MHI-18 psychological distress variable, cannabis use factors were not found to explain any unique variance. This indicates that the cannabis use factors do not have a direct relationship with psychological distress, and as such, may not play a substantial role in explaining psychological distress. Other factors appear to be much more important.

Psychotic Symptomology

The Schizotypal Personality Questionnaire (SPQ)

The brief version of the SPQ (SPQ-B) was designed to be used to screen for schizotypal personality disorder in situations where time limitations preclude the use of the full 74-item SPQ (Raine & Benishay, 1995). The SPQ-B is a self-report measure of schizotypal personality traits. All 22 items are of a Yes/No format with 'Yes' responses scored 1 and 'No' responses scored 0 (22 items, scoring range: 0-22). The SPQ-B consists of the most reliable items from the SPQ. It has no subscales, being scored on the three factors: cognitive-perceptual (8 items, range: 0-8); interpersonal (8 items, range: 0-8), and disorganized (6 items, range: 0-6) (Raine & Benishay, 1995). The cognitive-perceptual factor assesses positive schizotypal symptoms, such as magical thinking, ideas of references, paranoid ideation, odd beliefs, and unusual perceptual experiences. The interpersonal factor assesses negative schizotypal symptoms, such as constricted affect, lack of close friends, and, social anxiety. The disorganised factor assesses disorganised schizotypal symptoms, such as odd or eccentric behaviour and speech.

The SPQ-B has also been found to be valid (criterion validity, .66) and reliable (internal reliability, .76; test-retest reliability, .90) (2006). The SPQ-B was found to have good internal consistency reliability, based on the data from participants in the present study (N = 989), for total score (α = .83) and adequate reliability for the three factors (cognitive-perceptual, α = .68; interpersonal, α = .77; disorganised, α = .71). Raine and Benishay (1995) suggest that most individuals with schizotypal personality disorder will score 17 or above (top 10% of SPQ-B total scores), while a score of 2 or less (bottom 8% of SPQ-B total scores) indicates low levels of schizotypal symptomology.

Earleywine (2006) found that cannabis users appear to interpret two SPQ-B items differently from non-users. These items were: "Have you ever noticed a common event or

object that seemed to be a special sign for you?" (item 5, part of cognitive-perceptual factor), and "I sometime use words in unusual ways" (item 13, part of disorganized factor). Earleywine suggested that these SPQ-B items may tap non-schizotypal differences between users and non-users, such as the awareness of cannabis culture paraphernalia and the use of cannabis-related slang, rather than the delusions and peculiar word usage associated with psychoses. Furthermore, Earleywine found that after removing these two items from SPQ-B score calculations, differences between cannabis users and non-users were no longer statistically significant. For this reason, the two items have also been discarded in the present study. Thus, while the interpersonal factor remains unchanged, the adjusted SPQ-B total score ranges from 0-20 (α = .82), the cognitive-perceptual factor score ranges 0-7 (α = .68) and the disorganized factor score ranges from 0-5 (α = .70).

Levels of Psychotic Symptomology

SPQ-B Total Score

The mean SPQ-B score for the participants (N = 989) was 7.35 (SD = 4.53). A two-way ANOVA indicated a small age effect: $F(4, 988) = 6.12$, $p < .001$, $\eta^2 = .024$. However, no gender effects or interactions were indicated (see Appendices J21 & J22). A post hoc Tukey's HSD analysis indicated that participants aged in their teens (M = 7.94, SD = 4.39) and early twenties (M = 8.32, SD = 4.63) recorded significantly higher SPQ-B scores than the participants who were over 40 years of age (M = 6.22, SD = 4.40). Additionally, the participants who were aged in thirties (M = 6.60, SD = 4.30) also recorded significantly lower scores than those in their early twenties (see Appendix J23).

SPQ-B Factor Scores

Cognitive-Perceptual Factor. The mean cognitive-perceptual factor score for the participants (N = 989) was 2.39 (SD = 1.86). A two-way ANOVA indicated a small age

effect: $F(4, 988) = 5.79$, $p < .001$, $\eta^2 = .023$. However, no gender effects or interactions were indicated (see Appendices J24 & J25). A post hoc Tukey's HSD analysis (see Appendix J26) indicated that participants aged in their teens ($M = 2.71$, $SD = 1.75$) and early twenties ($M = 2.71$, $SD = 1.88$) recorded significantly higher scores on the cognitive-perceptual factor than the participants who were over 40 years of age ($M = 1.92$, $SD = 1.73$).

Interpersonal Factor. The mean interpersonal factor score for the participants ($N = 989$) was 3.20 ($SD = 2.37$). A two-way ANOVA indicated no significant age, gender, or interaction effects (see Appendices J27 & J28).

Disorganised Factor. The mean disorganised factor score for the participants ($N = 989$) was 1.77 ($SD = 1.56$). A two-way ANOVA indicated a small age effect: $F(4, 988) = 7.26$, $p < .001$, $\eta^2 = .028$. However, no gender effects or interactions were indicated (see Appendices J29 & J30). A post hoc Tukey's HSD analysis indicated that participants aged in their teens ($M = 1.95$, $SD = 1.62$) and early twenties ($M = 2.14$, $SD = 1.62$) recorded significantly higher scores on the disorganised factor than the participants who were over 40 years of age ($M = 1.41$, $SD = 1.41$). Additionally, the participants who were aged in thirties ($M = 1.45$, $SD = 1.52$) also recorded significantly lower scores than those in their early twenties (see Appendix J31).

To allow direct comparison between the SPQ-B total and factor scores, the mean scores for each were converted into percentage scores (see Figure 9.4). It is evident in this figure that, while participants were more likely to have experienced aspects of psychotic symptomology covered by the interpersonal factor, the participants mean scores for all factors was relatively low.

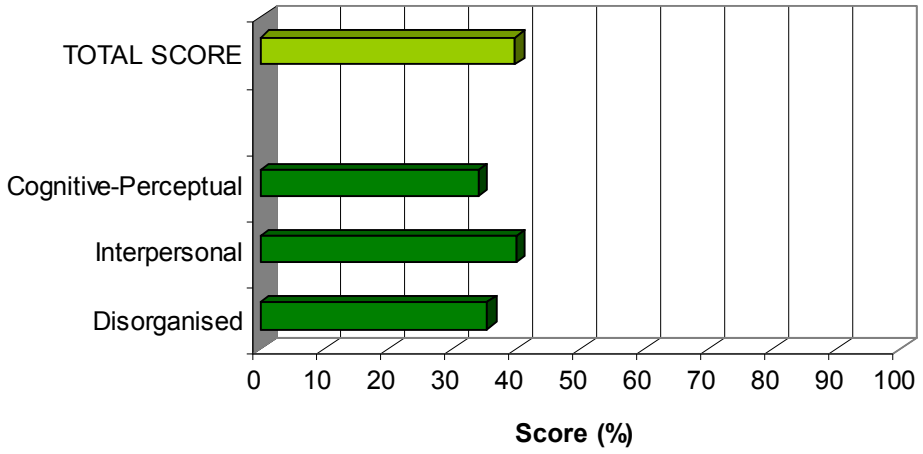

Figure 9.4. Mean SPQ-B total and factor scores (expressed as percentages)

Severity of Psychotic Symptomology

Clinical Groups

The SPQ-B has not been widely used with clinical samples, with many researchers and clinicians preferring to use the full length SPQ. However, Axelrod, Grilo, Sanislow, and McGlashan (2001) employed the SPQ-B with a sample of 237 adolescents (13-19 years) who were inpatients at a psychiatric hospital. The adolescents were categorised into four different diagnostic groups: personality disorder (PD; n = 34), conduct disorder (CD; n = 41), substance use disorders (SUD; n = 26), and major depression disorder (MDD; n = 61). Participants diagnosed with any personality disorder were found to have significantly higher SPQ-B total scores and interpersonal factor scores than the conduct disorder and substance disorders diagnostic groups.

The SPQ-B scores from Axelrod et al.'s (2001) study were compared to those for present study's depression groups using Coe's Effect Size Calculator (2006). Specifically, the SUD and MDD groups were compared with the present study's non-depressed and depression groups, respectively. To provide legitimate comparisons between these groups,

the unadjusted SPQ-B scores were utilised here (see Figure 9.5 and Appendix J31). These analyses indicated that the non-depressed participants in the present sample did not differ significantly from the Axelrod et al.'s SUD group in relation to SPQ-B total, cognitive-perceptual factor, or disorganisation factor scores, however the SUD group recorded significantly higher scores on the interpersonal factor (negative schizotypal symptoms) than the non-depressed participants in the present study (p = .01, *Cohen's* d = .50).

Axelrod et al.'s MDD group did not differ significantly from the present study's mild depression group on any of the SPQ-B scores, and did not differ significantly from the moderate depression group in relation to cognitive-perceptual or disorganised factor scores. However, the moderate depression group recorded significantly higher SPQ-B total (p = .01, d = .45) and interpersonal factor (p = .01, d = .45) than the MDD diagnostic group, and the severe depression group scored significantly higher than the MDD group on all of the SPQ-B scores: total score, p < .01, d = 1.02; cognitive-perceptual factor, p< .01, d = .53; interpersonal factor, p <.01, d = .96; disorganisation factor, p < .01, d = .60 (see Figure 9.5 and Appendix J31).

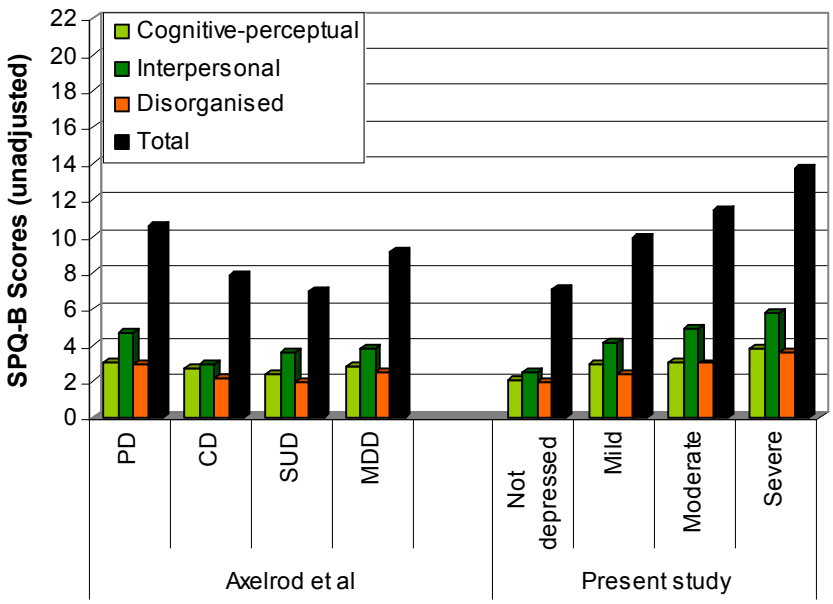

Figure 9.5. Comparison of SPQ-B scores.

For the present sample, a significant progression was evident over the depression groups, with non-depressed participants recording significantly lower SPQ-B total scores than mildly and moderately depressed participants, who in turn were significantly less likely to report schizotypal symptomology than severely depressed participants: $F(3, 988) = 86.75$, $p < .001$, $\eta^2 = .21$. For the cognitive-perceptual ($F[3, 988] = 35.36$, $p < .001$, $\eta^2 = .10$) and interpersonal factors ($F[3, 988] = 93.77$, $p < .001$, $\eta^2 = .22$), non-depressed participants scored significantly lower than all of the depressed groups, and mildly depressed participants scored significantly lower than the severely depressed participants. Furthermore, the non-depressed participants scored significantly lower on the disorganised factor ($F[3, 988] = 26.42$, $p < .001$, $\eta^2 = .07$) than moderately and severely depressed participants, and mildly depressed participants scored significantly lower than the participants who were severely depressed (see Figure 9.5 and Appendices J32-J34).

Non-Clinical Samples

A number of researchers have used the SPQ-B with undergraduate university samples. For example, as part of the developmental process for the SPQ-B, Raine and Benishay (1995) assessed a sample of 220 psychology students, while Barkus, Stirling, Hopkins, and Lewis (2006) assessed 137 students who were studying psychology or sociology. Coe's Effect Size Calculator (2006) was utilised for statistical comparison between the participants in the present study and the samples assessed by Raine and Benishay (1995) and Barkus et al. (2006). These analyses indicated that the participants in the present sample scored significantly lower than Raine and Benishay's sample on SPQ-B total scores ($p < .01$, *Cohen's* $d = .26$) and cognitive-perceptual factor scores ($p < .01$, $d = .37$), but did not differ significantly for interpersonal or disorganised factor scores. In contrast, participants in the present sample scored significantly higher than Barkus et al.'s sample on the disorganised

factor ($p < .01$, $d = .28$), but did not differ significantly for SPQ-B total scores, or cognitive-perceptual or interpersonal factor scores (see Table 9.5).

Table 9.5
Comparison of SPQ-B Total Scores with Non-Clinical Groups

	Raine & Benishay (*N* = 220)		**Barkus et al.** (*N* = 137)		**Present Study** (*N* = 989)	
	M	*SD*	*M*	*SD*	*M*	*SD*
SPQ-B total score	9.6	5.3	7.5	4.7	8.3	4.9
Cognitive-perceptual factor	3.6	2.3	3.0	2.1	2.8	2.1
Interpersonal factor	3.6	2.4	2.7	2.3	3.2	2.4
Disorganisation factor	2.5	1.9	1.8	1.8	2.3	1.8

High & Low Schizotypy

In line with Raine and Benishay (1995), participants with SPQ-B total scores of 2 or less were classified as having low levels of schizotypal personality traits, while those with scores of 17 or higher were classified as having high levels of schizotypy. This classification procedure was completed on the adjusted total scores (after removal of items 5 and 13) as well as the participants' unadjusted scores (see Table 9.6). It is interesting to note that the adjusted scores result in an almost halving of the number of participants classified with high schizotypy. Furthermore, this effect is not equivalent for males and females; 67% ($n = 16$) fewer females are classified as experiencing high levels of schizotypal symptomology when the adjusted SPQ-B total scores are utilised, in comparison to about a 37% ($n = 13$) reduction for the males.

Table 9.6
Schizotypal Symptomology Groups

	Female		Male		All	
	N	%	*N*	%	*N*	%
Unadjusted scores						
Low schizotypy	40	10.8	74	12.0	114	11.5
Moderate schizotypy	308	82.8	508	82.3	816	82.5
High schizotypy	24	6.5	35	5.7	59	6.0
Adjusted scores						
Low schizotypy	54	14.5	94	15.2	148	15.0
Moderate schizotypy	310	83.3	501	81.2	811	82.0
High schizotypy	8	2.2	22	3.6	30	3.0

Likelihood of Experiencing High Levels of Psychotic Symptomology

Odds ratios were calculated to determine which lifestyle and cannabis use factors placed participants at a high level of risk for experiencing high levels of psychotic symptomology (see Table 9.7). The unadjusted SPQ-B total score was employed for these analyses because Raine and Benishay's (1995) suggested cutpoint was based on the full 22 items. Thus, participants were categorised into two groups; those who were classified with high levels of psychotic symptomology (n = 59; 'high' = 1), and those with low or moderate levels (n = 930; 'low/moderate' = 2). The dichotomised lifestyle and cannabis use factors were those previously utilised in for MHI-5 scores.

Interestingly, participants who had engaged in a prolonged duration of cannabis use were slightly less likely to have high levels of psychotic symptomology than participants exhibiting shorter-term use (see Table 9.7). However, early initiators, daily user, and dependent users were not found to differ in comparison to participants who did engage in these patterns of cannabis use in relation to their levels of risk for experiencing psychotic

Table 9.7
Participants Meeting Risk Factor Criteria and Odds Ratio for High Psychotic Symptomology

	High (*N* = 59)		**Low/Moderate** (*N* = 930)			
	N	%	*N*	%	**OR**	**95% CI**
Key Cannabis Use Factors						
Early use	26	44.1 %	371	39.9 %	1.87	0.70 - 2.02
Daily use	43	72.9 %	617	66.3 %	1.36	0.76 - 2.46
Prolonged use	17	30.9 %	387	47.7 %	0.49 *	0.27 - 0.89
Dependent use	10	16.9 %	117	12.6 %	1.42	0.70 - 2.88
Current Lifestyle Factors						
Demographic & Environmental						
Female	24	40.7 %	348	34.7 %	1.15	0.67 - 1.96
Young	30	50.8 %	376	40.4 %	1.52	0.90 - 2.58
Single	47	79.7 %	531	57.1 %	2.94 **	1.54 - 5.62
Unemployed	14	23.7 %	135	14.5 %	1.83	0.98 - 3.43
Low SES (self)	55	93.2 %	671	72.2 %	5.31 ***	1.90 - 14.79
Low education	24	40.7 %	249	26.8 %	1.87 *	1.09 - 3.22
Urban	17	28.8 %	260	28.0 %	1.04	0.58 - 1.87
Friends use cannabis	36	61.0 %	545	58.6 %	1.11	0.65 - 1.90
Individual						
High alcohol use	7	11.9 %	102	11.0 %	1.09	0.48 - 2.47
High tobacco use	31	52.5 %	396	42.6 %	1.49	0.88 - 2.53
Poly-substance use	29	49.2 %	421	45.3 %	1.17	0.69 - 1.98
High sensation seeking	23	39.0 %	277	29.8 %	1.51	0.88 - 2.59
Poor health	37	62.7 %	356	38.3 %	2.71 ***	1.57 - 4.67
Sleep problems	36	61.0 %	423	45.5 %	1.88 *	1.09 - 3.22
MHI-5 depressed	39	66.1 %	145	15.6 %	10.56 ***	5.99 - 18.62
Childhood Lifestyle Factors						
Environmental						
Sole parent	13	22.0 %	208	22.4 %	0.98	0.52 - 1.85
Low SES (parental)	23	39.0 %	329	35.4 %	1.17	0.68 - 2.00
Family addiction	38	64.4 %	513	55.3 %	1.46	0.85 - 2.53
High conflict	14	24.1 %	164	17.9 %	1.46	0.78 - 2.73
Domestic violence	30	50.8 %	415	44.6 %	1.28	0.76 - 2.17
Death of someone close	19	32.2 %	297	31.9 %	1.01	0.58 - 1.78

Table 9.7 continued

	High (*N* = 59)		**Low/Moderate** (*N* = 930)			
	N	%	*N*	%	**OR**	**95% CI**
Physical abuse	14	25.0 %	221	24.5 %	1.03	0.55 - 1.91
Sexual abuse	7	12.7 %	134	15.0 %	0.83	0.37 - 1.87
No adult support	30	50.8 %	379	40.8 %	1.50	0.88- 2.55
Individual						
Early tobacco use	45	76.3 %	620	66.7 %	1.61	0.87 - 2.97
Early alcohol use	32	54.2 %	435	46.8 %	1.35	0.80 - 2.29
Early substance use	11	18.6 %	110	11.8 %	1.71	0.86 - 3.39
High delinquent behaviour	25	42.4 %	283	30.4 %	1.68	1.00 - 2.87
Ran away from home	18	30.5 %	258	27.7 %	1.14	0.65 - 2.03
Childhood psychopathology	39	67.2 %	433	46.9 %	2.32 **	1.32 - 4.08
ADD/ADHD	11	19.0 %	148	16.1 %	1.22	0.62 - 2.41

* $p < .05$, ** $p < .01$, *** $p < .001$

symptomology. Furthermore, very few of the lifestyle variables assessed in the present study were found to be associated with an increased or decreased level of risk for experiencing high levels of psychotic symptomology. Yet, participants who were currently depressed, experiencing health issues, and had a low proxy SES, were more likely to have reported high numbers of psychotic symptoms than participants unaffected by these risk factors While not as strong an association, having experienced psychopathology during childhood was also indicated as a factor related to elevated psychotic symptomology, as was being currently single.

Factors Associated with Psychotic Symptomology

As a further step towards understanding the nature of the association between cannabis use and psychotic symptomology, preliminary correlation analyses were completed between the cannabis use factors and the SPQ-B cognitive-perceptual (positive schizotypy)

and interpersonal (negative schizotypy) factor scores. Correlation analyses were also completed between these SPQ-B factors and both childhood and current lifestyle factors to identify potentially confounding variables (see Appendix J35). Variables found to be significantly associated with the SPQ-B factors were then entered into stepwise multiple regression analyses. For each of the SPQ-B factors four initial multiple regression analyses were completed; one each for cannabis use factors, childhood lifestyle factors, and current lifestyle factors, with the fourth multiple regression containing the variables that were significantly indicated in the prior analyses as being associated with the SPQ-B factors. A final multiple regression contained the key variables indicated in the fourth multiple regression and associated motives for cannabis use and subjective experiences of cannabis use (see Appendix J35) to determine the role played by theses aspects of cannabis use. Because of the association identified previously in this chapter, the MHI-18 psychological distress domain variable was also included in the final regression analyses.

Cognitive-Perceptual Factor

The first stepwise multiple regression analysis, investigating associations between cognitive-perceptual factor scores and cannabis use factors, included six variables: proxy dependence, number of proxy dependence criteria, using cannabis alone, concurrent tobacco use, and normal and highest levels of intoxication. The three variables retained in the final regression model (number of proxy dependence criteria, highest level of intoxication, and concurrent tobacco use) only explained 6% of the variance in cognitive-perceptual factor scores: $F(3, 747) = 15.36$, $p < .001$ (see Table 9.8 and Appendix J36). The second and third stepwise multiple regression analyses, investigating associations with current and childhood lifestyle factors (respectively), identified six current (single marital status, highest level of education, frequency of tobacco use, sensation seeking, and sleep and health problems) and two childhood (psychopathology and delinquent behaviour) lifestyle factors as potential

Table 9.8
Multiple Regression on Cognitive-Perceptual Factor Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Cannabis Use Factors (*Adj.* R^2 = .055)						
Highest level of intoxication	0.25	0.07	0.14	3.80	<.001	.018
No. of proxy dependence criteria	0.14	0.05	0.12	3.18	.002	.013
Concurrent tobacco use	0.23	0.08	0.11	2.95	.003	.011
Current Lifestyle Factors (*Adj.* R^2 = .131)						
Highest level of education	- 0.26	0.05	- 0.15	- 4.96	<.001	.022
Sleep problems	0.27	0.06	0.14	4.27	<.001	.016
Health problems	0.22	0.05	0.14	4.23	<.001	.016
Tobacco use	0.10	0.03	0.12	4.03	<.001	.014
Sensation seeking	0.04	0.01	0.11	3.75	<.001	.012
Single marital status	0.40	0.12	0.11	3.50	<.001	.011
Childhood Lifestyle Factors (*Adj.* R^2 = .063)						
Childhood psychopathology	0.36	0.06	0.20	6.26	<.001	.038
Delinquent behaviour	0.04	0.01	0.14	4.61	<.001	.020
Fourth Regression Model (*Adj.* R^2 = .157)						
Delinquent behaviour	0.04	0.01	0.13	3.68	<.001	.015
Highest level of intoxication	0.21	0.06	0.12	3.48	.001	.014
Health problems	0.20	0.06	0.13	3.56	.001	.013
Single marital status	0.45	0.13	0.12	3.41	.001	.013
Highest level of education	- 0.20	0.06	- 0.11	- 3.14	.002	.011
Tobacco use	0.08	0.03	0.10	2.76	.006	.009
Child psychopathology	0.19	0.07	0.10	2.69	.007	.008
Motive & Experience Factors (*Adj.* R^2 = .141)						
Self-Medication motives	0.12	0.02	0.18	5.21	<.001	.032
Psychopathological experiences	0.16	0.03	0.20	5.10	<.001	.031
Altered reality experiences	0.05	0.01	0.16	4.14	<.001	.020
Final Regression Model (*Adj.* R^2 = .223)						
Altered reality experiences	0.07	0.01	0.24	7.15	<.001	.053
MHI-18 depression	0.03	<0.01	0.23	6.50	<.001	.044
Health problems	0.21	0.06	0.13	3.78	<.001	.015
Highest level of education	- 0.20	0.06	- 0.11	- 3.41	.001	.012
Tobacco use	0.09	0.03	0.10	3.13	.002	.010
Delinquent behaviour	0.03	0.01	0.10	2.81	.005	.008

confounds (see Table 9.8 and Appendix J36).

The fourth stepwise multiple regression analysis contained all 11 of the variables identified through the previous analyses as being significantly associated with cognitive-perceptual factor scores. Eight of these variables were retained in the final regression model, explaining 16% of the variance in cognitive-perceptual factor scores: $F(8, 745) = 18.35$, $p < .001$ (see Table 9.8 and Appendix J36). The only cannabis use factor retained in the latter regression model was the highest level of intoxication. However, no cannabis use variables were retained after self-medication motives for use, altered reality and psychopathological subjective experiences, and MHI-18 depression and anxiety, were included in the final regression analysis (see Table 9.8 and Appendix J36). Rather, altered reality subjective experiences and depression accounted for the highest proportions of variance in cognitive-perceptual factor scores, with health problems, level of education, current frequency of tobacco use, and childhood/adolescent delinquent behaviour, also adding to the 22% of cognitive-perceptual factor score variance explained by the six variables.

Interpersonal Factor

The first stepwise multiple regression analysis, investigating associations between interpersonal factor scores and cannabis use factors, included four variables: proxy dependence, number of proxy dependence criteria, using cannabis alone, and highest level of intoxication. The two variables retained in the final regression model (number of proxy dependence criteria, and solitary use) only explained 5% of the variance in interpersonal factor scores: $F(3, 755) = 22.75$, $p < .001$ (see Table 9.9 and Appendix J36). The second and third stepwise multiple regression analyses, investigating associations with current and childhood lifestyle factors (respectively), identified three current (single marital status, proxy SES, and sleep problems) and four childhood (proxy SES, family addiction problems,

psychopathology, and lack of adult support) lifestyle factors as potential confounds (see Table 9.9 and Appendix J36).

Table 9.9
Multiple Regression on Interpersonal Factor Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Cannabis Use Factors (*Adj.* R^2 = .054)						
Solitary use	0.38	0.08	0.18	4.81	<.001	.029
No. of proxy dependence criteria	0.17	0.06	0.11	3.04	.002	.012
Current Lifestyle Factors (*Adj.* R^2 = .054)						
Sleep problems	0.50	0.08	0.20	6.52	<.001	.041
Proxy SES (self)	0.18	0.05	0.11	3.55	<.001	.012
Childhood Lifestyle Factors (*Adj.* R^2 = .081)						
Childhood psychopathology	0.37	0.07	0.16	5.00	<.001	.023
Lack of adult support	0.26	0.05	0.15	4.72	<.001	.021
Proxy SES (parental)	0.14	0.03	0.12	3.96	<.001	.015
Family addiction problems	0.16	0.06	0.08	2.68	.007	.008
Fourth Regression Model (*Adj.* R^2 = .122)						
Solitary use	0.36	0.08	0.17	4.82	<.001	.027
Childhood psychopathology	0.32	0.09	0.14	3.76	<.001	.016
Lack of adult support	0.22	0.06	0.13	3.57	<.001	.015
Sleep problems	0.29	0.09	0.12	3.19	.001	.012
Proxy SES (parental)	0.12	0.04	0.11	3.10	.002	.011
Motive & Experience Factors (*Adj.* R^2 = .114)						
Psychopathological experiences	0.27	0.04	0.26	7.41	<.001	.067
Self-Medication motives	0.15	0.03	0.18	5.11	<.001	.032
Final Regression Model (*Adj.* R^2 = .293)						
MHI-18 depression	0.06	0.01	0.43	12.82	<.001	.154
Solitary use	0.29	0.07	0.14	4.45	<.001	.018
Psychopathological experiences	0.13	0.04	0.12	3.71	<.001	.013
Proxy SES (parental)	0.12	0.03	0.11	3.55	<.001	.012

The fourth stepwise multiple regression analysis contained all eight of the variables identified through the previous analyses as being significantly associated with interpersonal

factor scores. Five of these variables were retained in the final regression model, explaining 12% of the variance in interpersonal factor scores: $F(5, 764) = 22.24$, $p < .001$ (see Table 9.9 and Appendix J36). The only cannabis use factor retained in the latter regression model was using cannabis alone. This variable continued to explain a significant proportion of the variance in interpersonal factor scores after self-medication motives for use, psychopathological subjective experiences, and MHI-18 depression and anxiety, were included in the final regression analysis (see Table 9.9 and Appendix J36). MHI-18 depression accounted for the highest proportion of variance in interpersonal factor scores, while using cannabis alone, psychopathological subjective experiences, and parental proxy SES also contributed to explaining 29% of variance.

In summary, cannabis use factors explained small amounts of the variance in SPQ-B cognitive-perceptual (5.5%) and interpersonal (5.4%) factor scores, but tended to explain less variance than current lifestyle factors (cognitive-perceptual, 13.1%; interpersonal, 5.4%) and childhood lifestyle factors (cognitive-perceptual, 6.3%; interpersonal, 8.1%). When lifestyle factors were included in the regression analyses with the cannabis use factors, the highest level of intoxication continued to be significantly associated with the cognitive-perceptual factor scores. However, after the addition of self-medication motives for use, altered reality and psychopathological subjective experience of use, and MHI-18 depression and anxiety subscales, cannabis use factors were not found to explain any unique variance. This indicates that the cannabis use factors do not have a direct relationship with cognitive-perceptual factor scores. In contrast, solitary cannabis use remained significantly associated with interpersonal factor scores after the introduction of self-medication motives for use, psychopathological subjective experience of use, and MHI-18 depression and anxiety subscales.

Bidirectional Relationships

As a further step towards understanding the nature of the association between cannabis use and psychopathology, four additional regression analyses were undertaken to determine if the previously identified relationships were bidirectional in nature. These analyses added relevant psychopathological variables to the variables identified previously as explaining unique proportions of variance in psychopathological and altered reality subjective experiences of intoxication (see Chapter 8), self-medication motives for use (see Chapter 8), and the number of proxy dependence criteria endorsed by participants (see Chapter 7). The first three of these variables were chosen for further investigation because they were identified above as contributing significantly to the explanation of variance in psychopathological variables, while the number of proxy dependence criteria was chosen because it was the cannabis use factor most commonly associated with psychopathology variables in prior analyses in the present chapter.

Psychopathological Experiences of Use

In Chapter 8, the final stepwise multiple regression analysis investigating psychopathological experiences of use found that that two cannabis use factors (number of proxy dependence criteria and strength of cones/joints), two motives and intoxication factors (external influences and highest level of intoxication), and two current lifestyle factors (health problems and frequency of alcohol use) explained 23% of the variance in psychopathological experience subscale scores (see Table 9.10). MHI-18 depression and anxiety subscales, and the SPQ-B interpersonal factor, were added to the final stepwise multiple regression analysis of psychopathological experience subscale scores.

Both anxiety and depression were found to explain significant proportions of variance in psychopathological experience scores; however, strength of cones/joints and health problems were not retained in the final regression model. This final regression model

explained a further 7% of variance in psychopathological experience subscale scores: *Adj.* R^2 = .30; $F(6, 728) = 52.96$, $p < .001$ (see Table 9.10 and Appendix J37).

Table 9.10
Multiple Regression on Psychopathological Experiences Subscale Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Final Regression Model (Chapter 8) (*Adj.* R^2 = .228)						
External influences motives	0.16	0.02	0.24	6.68	<.001	.049
Highest level of intoxication	0.43	0.07	0.20	5.80	<.001	.035
No. of proxy dependence criteria	0.24	0.05	0.16	4.50	<.001	.022
Alcohol use	0.21	0.06	0.11	3.37	.001	.014
Strength of cones/joints	- 0.05	0.02	- 0.12	- 3.47	.001	.012
Health problems	0.23	0.07	0.12	3.40	.001	.012
Final Regression Model (*Adj.* R^2 = .300)						
External influences motives	0.13	0.02	0.20	5.74	<.001	.032
MHI-18 anxiety	0.04	0.01	0.19	4.82	<.001	.022
Highest level of intoxication	0.33	0.07	0.15	4.79	<.001	.022
MHI-18 depression	0.03	0.01	0.17	4.37	<.001	.018
No. of proxy dependence criteria	0.19	0.05	0.13	3.77	<.001	.014
Alcohol use	0.21	0.06	0.11	3.65	<.001	.013

Altered Reality Experiences of Use

The final stepwise multiple regression analysis investigating altered reality experiences of cannabis use (in Chapter 8) found that that one cannabis use factor (duration of use), two motives and intoxication factors (social/enhancement motives and highest level of intoxication), and one current lifestyle factor (sensation seeking) explained 34% of the variance in altered reality subscale scores (see Table 9.11). When the SPQ-B cognitive-perceptual factor was added to the final stepwise multiple regression analysis of altered reality

subscale scores a further 2% of variance in altered reality subscale scores was explained: *Adj.* $R^2 = .36$; $F(5, 736) = 83.28$, $p < .001$ (see Table 9.11 and Appendix J37).

Table 9.11
Multiple Regression on Altered Reality Subscale Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Final Regression Model (Chapter 8) (*Adj.* $R^2 = .338$)						
Social/enhancement motives	0.38	0.04	0.32	10.00	<.001	.096
Highest level of intoxication	1.47	0.18	0.26	8.09	<.001	.064
Duration of use	- 0.50	0.09	- 0.18	- 5.46	<.001	.026
Sensation seeking	0.17	0.04	0.13	4.11	<.001	.015
Final Regression Model (*Adj.* $R^2 = .359$)						
Social/enhancement motives	0.37	0.04	0.31	9.94	<.001	.086
Highest level of intoxication	1.39	0.18	0.24	7.82	<.001	.053
Duration of use	- 0.45	0.09	- 0.16	- 5.13	<.001	.023
SPQ-B cognitive-perceptual	0.49	0.10	0.15	4.96	<.001	.021
Sensation seeking	0.14	0.04	0.11	3.61	<.001	.011

Self-Medication Motives for Use

In Chapter 8, the final stepwise multiple regression analysis investigating self-medication motives for use found that that three cannabis use factors (number of proxy dependence criteria, peak level of use, and solitary use), three current lifestyle factors (gender, health problems, and peer cannabis use), and one childhood lifestyle factor (psychopathology) explained 36% of the variance in self-medication subscale scores (see Table 9.12). MHI-18 depression and anxiety subscales were added to the final stepwise multiple regression analysis of self-medication subscale scores.

Current depression levels were found to explain significant proportions of variance in self-medication subscale scores; however, childhood psychopathology was not retained in the final regression model. This final regression model explained a further 2% of variance in self-

medication subscale scores: *Adj.* R^2 = .38; $F(7, 754) = 67.68$, $p < .001$ (see Table 9.12 and Appendix J37).

Table 9.12
Multiple Regression on Self-Medication Motive Subscale Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Final Regression Model (Chapter 8) (*Adj.* R^2 = .362)						
Solitary use	0.89	0.08	0.34	10.60	<.001	.095
Health problems	0.54	0.08	0.22	6.97	<.001	.041
Gender	- 0.86	0.19	- 0.14	- 4.59	<.001	.018
Peak level of use	0.27	0.07	0.14	4.15	<.001	.015
No. of proxy dependence criteria	0.25	0.06	0.13	3.93	<.001	.013
Childhood psychopathology	0.34	0.09	0.12	3.85	<.001	.013
Peer cannabis use	0.23	0.09	0.09	2.73	.007	.006
Final Regression Model (*Adj.* R^2 = .382)						
Solitary use	0.85	0.08	0.32	10.31	<.001	.087
Health problems	0.53	0.08	0.21	7.07	<.001	.041
MHI-18 depression	0.04	0.01	0.19	6.32	<.001	.033
Peak level of use	0.29	0.06	0.15	4.61	<.001	.017
Gender	- 0.79	0.18	- 0.13	- 4.30	<.001	.015
Peer cannabis use	0.27	0.08	0.10	3..19	.001	.008
No. of proxy dependence criteria	0.18	0.06	0.09	3.86	.004	.007

Number of Proxy Dependence Criteria

The relationships between proxy dependence criteria and motives for cannabis use and subjective experiences of use have not been previously explored. Therefore, preliminary correlation analyses were first undertaken (see Appendix J38) followed by a stepwise multiple regression including relevant variables (see Table 9.13 and Appendix J37), were undertaken to identify motives and experience variables for inclusion in the final multiple regression analysis investigating the number of proxy dependence criteria endorsed by participants.

In Chapter 7, the final stepwise multiple regression analysis investigating self-medication motives for use found that that six cannabis use factors (weekly number of cones/joints, frequency of use, daily dose group, solitary use, concurrent substance use, and highest level of intoxication) and one childhood lifestyle factor (delinquent behaviour) explained 35% of the variance in the number of proxy dependence criteria endorsed by the participants (see Table 9.13). MHI-18 depression and anxiety subscales, SPQ-B cognitive-perceptual and interpersonal factors, self-medication and external influences motives, and psychopathological experiences and physiological effects, were added to the final stepwise multiple regression analysis investigating the number of proxy dependence criteria endorsed by participants.

While 40% of variance in the number of proxy dependence criteria endorsed by participants was explained by the final regression model, the MHI-18 and SPQ-B subscales were not retained, nor were daily dose group, normal level of intoxication, concurrent substance use, or delinquent behaviour. Thus, the number of proxy dependence criteria endorsed by participants was found to be significantly associated with the weekly number of cones/joint, frequency of use, solitary use, being motivated to use by external influences, having psychopathological experiences of use, and experiencing physiological effects of use (e.g., red eyes, 'munchies', dry mouth/throat). This final model explained 5% more of the variance in number of proxy dependence criteria than the model based solely on cannabis use and lifestyle factors: *Adj.* $R^2 = .40$; $F(6, 697) = 78.92$, $p < .001$ (see Table 9.13 and Appendix J37).

Table 9.13
Multiple Regression on Number of Proxy Dependence Criteria

	B	*SE B*	*β*	*t*	*p*	sr^2
Motives & Experiences Model (*Adj.* R^2 = .220)						
Self-medication motives	0.12	0.02	0.23	6.43	<.001	.045
External influences motives	0.08	0.02	0.20	5.19	<.001	.029
Psychopathological experiences	0.09	0.03	0.13	3.57	<.001	.014
Physiological effects of use	0.04	0.01	0.13	3.43	.001	.013
Final Regression Model (Chapter 7) (*Adj.* R^2 = .347)						
Weekly number of cones/joints	0.36	0.05	0.54	7.44	<.001	.047
Frequency of use	0.27	0.05	0.21	5.22	<.001	.019
Solitary use	0.24	0.05	0.16	4.75	<.001	.015
Daily dose group	- 0.20	0.05	- 0.31	- 4.48	<.001	.020
Delinquent behaviour	0.03	0.01	0.12	3.87	<.001	.014
Normal level of intoxication	0.17	0.04	0.12	3.84	<.001	.013
Concurrent substance use	0.33	0.09	0.12	3.68	<.001	.010
Final Regression Model (*Adj.* R^2 = .401)						
Weekly number of cones/joints	0.16	0.02	0.27	6.75	<.001	.039
External influences motives	0.08	0.01	0.19	5.94	<.001	.030
Psychopathological experiences	0.12	0.02	0.18	5.34	<.001	.025
Solitary use	0.20	0.05	0.14	4.29	<.001	.016
Frequency of use	0.18	0.05	0.16	3.80	<.001	.012
Physiological effects of use	0.03	0.01	0.09	2.73	.007	.006

Summary & Discussion

The objective of the present chapter was to investigate the nature of the association between cannabis use and psychopathology. This included determining the likelihood of users experiencing psychopathology, the severity with which it was experienced and, the 'real

word' impact of any adverse use-related issues on the ability of users to function in their daily lives.

Severity of Psychopathology & Impact on Everyday Functioning

While the participants' MHI-5 scores did not differ significantly from the Australian norms, the utilisation of clinically validated MHI-5 cut-off scores led to 19% of the participants in the present study being identified as experiencing depression. Australian population level data indicates that approximately 6% of adults experience depressive disorders each year (Henderson, Andrews, & Hall, 2000). Thus, the proportion of participants in the present study who were currently depressed was substantially higher than would be expected in a general population sample. Additionally, while the SPQ-B is not a diagnostic assessment tool, a total of 6% of participants were classified as experiencing high levels of psychotic symptomology. This was also substantially higher than the Australian population level estimates of approximately 0.5% of adults experiencing psychotic disorders each year (Jablensky et al., 2000). Importantly, there was a high level of comorbidity with depression, with 81% of participants classified as having high levels of psychotic symptomology also classified as being currently depressed, thus supporting the findings of Liraud and Verdoux (2002) and Spitznagel and Suhr (2004).

Henderson et al. (2000) found that individuals who were experiencing anxiety or depression were unable to fulfill their usual daily activities on an average 2.1 and 2.7 days (respectively) in the previous four weeks. Individuals with substance use disorders had approximately 1 day out of role during the previous four weeks, which was similar to that reported by people without any disorders. However, individuals reporting comorbidity between affective, anxiety and substance use disorders (2 or more of these conditions) reported approximately 3.5 days out of role in the previous four weeks; hence they were unable to carry out their usual daily activities and fulfill their responsibilities on

approximately one day each week. Further, Jablensky et al. (2000) found that individuals who were experiencing psychotic disorders suffered considerable levels of impairment in daily living, with up to 49% identified as being unable to fulfill their usual daily household activities and 46% exhibiting impaired performance in their main occupational role. However, 48% of Jablensky et al.'s sample was assessed as having experienced little or no incapacitation in fulfilling their usual daily activities.

Using these past research findings, we would expect that up to 6% of the participants would be likely to encounter impaired everyday functioning in relation to their high levels of psychotic symptomology, with those experiencing comorbidity more likely to be impaired (see Table 9.14). The 3% of participants classified with both proxy cannabis dependence and depression would be expected to have approximately 3.5 days per month on which they were unable to fulfill their usual activities or meet their responsibilities. While the 11% of participants experiencing depression, without comorbidity, would be expected have about 2.7 days per month out of role. Therefore, approximately 20% of the participants were likely to experience some level of impaired everyday functioning because of their levels of psychopathology. Further, of these participants, 15% would have had their level of functionality negatively affected by their comorbid cannabis dependence (see Table 9.14).

The participants identified as being at the most likely to experience depression, and hence experience impaired everyday functioning, were dependent on cannabis, single, unemployed, with low proxy SES, who reported both health and sleep problems. In childhood they had experienced psychopathology and did not have an adult who they could turn to for help or support when needed. Additional factors associated with increased risk for experiencing depression included female gender, low educational attainment, high tobacco use, and high levels of delinquent behaviour during childhood/adolescence.

Similarly, the participants identified as being at the most likely to report high levels of psychotic symptomology were depressed, experiencing health problems, and had a low proxy

SES. While being single and experiencing psychopathology during childhood/adolescence were also associated with increased risk for experiencing high levels of psychotic symptomology.

Table 9.14
Participants by Psychopathology and Proxy Dependence

	Females (*N* = 372)	**Males** (*N* = 617)	**All** (*N* = 989)
High psychotic symptoms only	1.6 %	1.6 %	1.6 %
Plus proxy dependence	0.5 %	0.3 %	0.4 %
Plus depression	3.8 %	3.1 %	3.3 %
Plus proxy dependence & depression	0.5 %	0.6 %	0.6 %
ALL WITH HIGH PSYCHOTIC SYMPTOMS	**6.4 %**	**5.6 %**	**5.9 %**
Proxy dependence & depression	5.1 %	2.4 %	3.4 %
Depression only	14.0 %	9.6 %	11.2 %
ALL WITH IMPAIRED DAILY FUNCTIONING	**25.5 %**	**17.6 %**	**20.5 %**
Proxy dependence only	7.5 %	8.9 %	8.4 %
No Disorders	66.9 %	73.4 %	71.0 %
ALL WITH NORMAL DAILY FUNCTIONING	**74.4 %**	**82.3 %**	**79.4 %**

Relationship between Cannabis Use & Psychopathology

In this study, early onset of cannabis use was not found to be related to later psychological distress. This is consistent with findings from the Christchurch Health and Development Study and the Dunedin Multidisciplinary Health and Development Study (Arseneault et al., 2002; Fergusson & Horwood, 1997; McGee et al., 2000). No relationship was found between frequency of cannabis use and psychological distress, which is dissimilar to past research findings (Fergusson et al., 2002; Patton et al., 2002). Likewise, the absence of

an association between schizotypal symptoms and early initiation of cannabis use in this study does not support past research findings (Arseneault et al., 2002; Stefanis et al., 2004), nor does the lack of a relationship with frequency of cannabis use (Fergusson et al., 2005).

Initial regression analyses indicated that cannabis use factors explained small amounts of the variance in MHI-18 depression and anxiety subscale scores, and SPQ-B cognitive-perceptual and interpersonal factor scores, with the number of proxy dependence criteria significantly associated with all four of the psychopathology variables. Although these findings supported the significant association between cannabis dependence and schizotypal symptoms found by Johns et al. (2004), the association between proxy dependence criteria and the SPQ-B factors was no longer significant after lifestyle factors were taken into account. Furthermore, the number of proxy dependence criteria endorsed by the participants did not continue to explain a unique proportion of the variance of either of the MHI-18 subscale scores after motives for use, subjective experiences of use, and the alternate psychological distress variable were included in the regression model. In fact, cannabis use factors were notably absent from the final regression models for all but one of the psychopathological variables assessed here (using cannabis alone explained a significant proportion of variance in interpersonal factor scores, but this is typical of the social deficits experienced by those with high levels of negative symptomology). Therefore, it appears that the cannabis use factors assessed in the present study do not have a direct relationship with depression, anxiety, or positive or negative psychotic symptomology.

Almost half (46%) of the variance in MHI-18 depression scores were explained by anxiety scores, using cannabis for self-medication purposes, psychopathological experiences of use, experiencing psychopathology and a lack of adult support in childhood/adolescence, and being currently single. While 41% of variance in MHI-18 anxiety subscale scores was explained by depression scores, psychopathological subjective experiences, and having self-identified health issues. A total of 29% of SPQ-B interpersonal factor scores were explained

by depression scores, using cannabis alone, having psychopathological subjective experiences of use, and low parental proxy SES during childhood. For SPQ-B cognitive-perceptual factor scores, 22% of the variance was explained by altered reality experiences of use, depression scores, self-identified health issues, low educational attainment, frequency of tobacco use, and delinquent behaviour during childhood/adolescence. These results indicate the high level of comorbidity with regards to the psychopathology variables, specifically the role played by depression. Also evident is the importance of subjective experiences of acute cannabis use, specifically, psychopathological subjective experiences (e.g., feeling depressed, anxious, paranoid, and/or suicidal).

A total of 30% of the variance in psychopathological experiences of use was explained by external influence motivations for use (e.g. peer pressure, using to fit in or feel normal), anxiety scores, highest level of intoxication, depression scores, number of proxy dependence criteria, and frequency of alcohol consumption. These findings support the observance that adverse subjective experiences of cannabis use appear to occur more often in drug naïve or anxious users, or those with psychological vulnerabilities (Ashton, 2001).

Additionally, there is evidently a bidirectional relationship between adverse acute effects of cannabis use and psychopathology, whereby individuals experiencing psychological distress may be more susceptible to the adverse outcomes of use, while individuals who experience acute adverse effects of cannabis use may be more likely to experience psychopathology. Thus, results suggest that the individuals experiencing high levels of depression and anxiety are also those who are most likely to experience psychological distress while intoxicated, with these adverse acute effects of intoxication, in turn, seemingly exacerbating the psychological distress experienced by the individuals. Moreover, these results make the bidirectional relationship between depression scores and self-medication motives for cannabis use (e.g. using to relieve depression, anxiety) appear somewhat counterintuitive. A total of 38% of the variance in self-medication subscale scores was

explained by using cannabis alone, self-identified health issues, depression scores, peak level of cannabis use, female gender, peer cannabis use, and the number of proxy dependence criteria endorsed by the participants.

SPQ-B cognitive-perceptual factor scores were found to have a bidirectional relationship with altered reality subjective experiences of cannabis use. With 38% of variance in altered reality subscale scores explained by using cannabis for social/enhancement motives, highest levels of intoxication, shorter durations of cannabis use, cognitive-perceptual factor scores, and high sensation seeking. This suggests that individuals experiencing high levels of positive psychotic symptomology are likely to experience the same sort of effects (e.g., unusual perceptual experiences, hallucinations) while under the influence of cannabis, with the altered reality experiences of cannabis use then perhaps exacerbating the levels of positive symptomology experienced when the individuals are not intoxicated. This finding supports differences evident between positive symptomology (hyperdopominergic) and negative symptomology (hypodopominergic) discussed in Chapter 1, whereby cannabis use results in an increase in neurotransmission in the prefrontal region of the brain leading to increased positive symptomology (Dinn, Harris, Aycicegi, Greene, & Andover, 2002; Spitznagel & Suhr, 2004).

Conclusions

When all these results are looked at together, it appears that the relationship between cannabis use factors and psychopathology are primarily mediated by the motives for cannabis use and subjective experiences of cannabis use variables. However, these relationships may also be bidirectional. For example, the number of proxy dependence criteria endorsed by participants explained significant proportions of variance in both psychopathological experiences and self-medication motives subscale scores, while external influence motives and psychopathological subjective experiences explained significant proportions of variance

in proxy dependence criteria. However, the latter relationship is unsurprising because one of the dependence criteria relates to adverse psychological effects of use. Similarly, the association with external influences motives for use is explained in part by the inclusion of use to avoid withdrawal symptoms (another dependence criterion) in the motives subscale.

In summary, cannabis use factors explained small amounts of variance in MHI-18 anxiety and depression subscale scores, and SPQ-B cognitive-perceptual and interpersonal factor scores. However, these cannabis use factors were not retained in the final regression models once potential confounds were included, with the results suggesting that the relationship between cannabis use factors is mediated by motives for use and subjective experiences of use variables. Bidirectional relationships were identified between psychological distress variables and psychopathological subjective experiences of use, and between altered reality experiences and positive psychotic symptomology, such that cannabis use appears to exacerbate the psychopathological symptomology of participants with current mental health issues. There was also a high level of comorbidity evident between the psychopathology variables, with depression accounting for significant variance in anxiety, cognitive-perceptual and interpersonal scores. Therefore, it is important to note the significant association identified between the MHI-18 depression subscale and childhood psychopathology, whereby two-thirds of the participants currently experiencing depression reported pre-existing mental health issues from childhood/adolescence.

Five potential types of relationship between cannabis use and psychopathology were outlined at the beginning of this chapter. The results discussed here do not support a direct causal relationship (whereby cannabis use causes the development of psychological disorders) or an indirect causal relationship (where cannabis use has an impact on another variable, which then leads to psychopathology) between cannabis use and psychopathology. However there is support for there being no causal relationship, with risk factors common to both cannabis use and current psychopathology causing both disorders independently (specifically,

childhood psychopathology). And there was clear evidence of self-medication, with individuals experiencing psychological disorders using cannabis to 'treat' their symptoms or side-effects, although it appeared that cannabis use was perhaps more likely to actually exacerbate these symptoms. With more than 50% of the variance in psychopathological variable scores unexplained, there are clearly other important factors that were not assessed in the present study. It is likely that at least some of this variance would be explained by genetic factors (Caspi et al., 2005), thus providing room for a predisposition/vulnerability hypothesis, which proposes that cannabis use triggers psychological disorders in individuals with an underlying vulnerability or predisposition for that disorder.

It is also important to note here that the vast majority of participants were not classified as experiencing elevated levels of psychological distress (81%) or psychotic symptomology (94%). Moreover, those without any current psychopathology (N = 785, 79%) were unlikely to experience adverse subjective experiences of cannabis use, or have an impairment in their level of everyday functioning. Thus, these findings support those reported in Chapter 8, where it was evident that the vast majority of participants did not experience adverse effects of cannabis use. However, in the previous chapter there were also indications that there was group of participants for whom cannabis use appeared to be problematic. In light of the current findings, this group appears to include up to 21% of the participants who may experience impairments in their everyday functioning because of their levels of psychopathological symptomology, which appear to be exacerbated by their cannabis use. The relationship between cannabis use and everyday functioning will be investigated further, in relation to cognitive function, in Chapter 10.

Psychopathology Variables

A number of variables were described in this Chapter. They are displayed in Table 9.15, while the descriptive statistics for these variables are provided in Appendix J39.

Table 9.15
Psychopathology Variables

	Scoring Range	Score Interpretation
Mental Health Inventory		
MHI-18 Index (α=.94)	0 – 100	Higher score = greater wellbeing
Psychological distress domain (α=.92)	0 – 100	Higher score = higher distress
Depression subscale (α=.87)	0 – 100	Higher score = higher depression
Anxiety subscale (α=.83)	0 – 100	Higher score = higher anxiety
Loss of behavioural/emotional control (α=.81)	0 – 100	Higher score = greater loss of control
Psychological wellbeing domain (α=.82)	0 – 100	Higher score = higher wellbeing
Positive affect subscale (α=.83)	0 – 100	Higher score = higher positive affect
MHI-5 Index (α=.91)	0 – 100	Higher score = greater wellbeing
Unadjusted Schizotypal Personality Questionnaire - Brief		
Total score (α=.83)	0 – 22	Higher score = higher level of schizotypal symptomology
Cognitive-perceptual factor (α=.68)	0 – 8	Higher score = higher level of positive symptomology
Interpersonal factor (α=.77)	0 – 8	Higher score = higher level of negative symptomology
Disorganised factor (α=.71)	0 – 6	Higher score = higher level of disorganised symptomology
Adjusted Schizotypal Personality Questionnaire - Brief		
Total score (α=.82)	0 – 20	Higher score = higher level of schizotypal symptomology
Cognitive-perceptual factor (α=.68)	0 – 7	Higher score = higher level of positive symptomology
Disorganised factor (α=.70)	0 – 5	Higher score = higher level of disorganised symptomology

CHAPTER 10

COGNITIVE FUNCTIONING

Introduction

The third objective of the present study is to investigate: the nature of the association between cannabis use and previously reported adverse use-related issues; the likelihood of users experiencing these use-related issues; the severity with which they are experienced; and, the 'real word' impact of any adverse use-related issues on the ability of users to function in their daily lives. As noted in Chapter 1, the use-related issues to be examined are centered on aspects of everyday psychopathological and cognitive functioning; the former was investigated in the previous chapter, while the latter is investigated in the present chapter.

As noted in Chapter 1, much research has evaluated relationships between cannabis use and different aspects of objective cognitive functioning. However, the focus of this study was to evaluate relationships between cannabis use and self-reported impairments in cognitive failures and everyday and prospective memory function. Thus, the literature reviewed below is restricted to research findings relating to specifically to these aspects of cognitive function and cannabis use.

Cannabis Use and Memory Function

There is general consensus in the literature that the acute effects of cannabis consumption include memory dysfunction. In a recent review, Ranganathan and D'Souza (2006) concluded that the acute effects of cannabis use were associated with impairment in all phases of memory: encoding, consolidation, and retrieval. However, the nature of memory impairments that are related to the residual effects of cannabis use is more contentious.

As noted in Chapter 1, the acute effects of cannabis use are evident almost immediately upon consumption, and rarely persist beyond 3-4 hours (Ashton, 2001; Lukas, Mendelson, & Benedikt, 1995). Residual effects are those evident in the hours or days after the acute intoxication phase has passed, and are thought to be due to the accumulation of cannabinoids in the central nervous system (CNS)/brain. THC has an approximate tissue elimination half-life of 7 days, indicating that the effects might persist for many weeks after use (Klugman & Gruzelier, 2003; Pope, Gruber, Hudson, Huestis, & Yurgelun-Todd, 2001).

Ecstasy and Cannabis Research

Much of the recent research examining the cognitive effects of cannabis use has been prompted by attempts to understand the effects of ecstasy on cognitive functioning, because the majority of ecstasy users also consume cannabis (Croft, Mackay, Mills, & Gruzelier, 2001). In evaluating the relative contributions of these substances to cognitive impairments, these studies have typically included cannabis-only user groups in their research design, although many have used small sample sizes. In the studies discussed below, emphasis is placed on those findings relating to cannabis-only user groups in comparison to non-substance using controls.

Rogers (2000) examined cognitive function in three groups of participants: ecstasy users (who also used cannabis) (n=15), cannabis-only users (n=15), and nonusers of both substances (n=15). Participants in the cannabis-only group had been using on an average of 4 days per week, for 11 years in duration, however they had all decided to cease use, and had been abstinent for 1 month prior to testing. These participants were found to perform worse than control group participants on a verbal memory task, but there were no differences in delayed or visual memory between cannabis users and controls. Similar results were evident in a study by Lamers, Bechara, Rizzo, and Ramaekers (2006), which evaluated 11 ecstasy/cannabis users, 15 cannabis users, and 15 nonusers. In this study, cannabis-only users

had consumed the substance on an average of 1582 days in their lifetime, and had been abstinent for a mean of 15 days prior to testing. Cannabis-only users were found to exhibit impaired immediate recall compared to controls, but no significant differences were found in either delayed recall or delayed memory tasks.

Further, a study of 31 controls, 18 cannabis-only users, and 11 cannabis/ecstasy users found that cannabis-only users performed significantly worse than controls on a memory task (Croft et al., 2001). Cannabis-only users in this study had consumed an average of 7762 joints in their lifetime and had been abstinent for an average of 4 days. Similarly, cannabis users were found to perform worse than controls on immediate and delayed passage recall, as well as a free recall task, in a study by Dafters, Hoshi, and Talbot (2004). Their 15 cannabis-only users had consumed an average of 1023 joints in their lifetime, and were required to be abstinent for at least 48 hours prior to testing.

Current frequency of cannabis use was found to predict both immediate and delayed visual memory in another study of 40 ecstasy users and 27 cannabis-only users (Simon & Mattick, 2002). However, in this study, cannabis use was not found to predict immediate or delayed auditory memory, immediate memory, general memory, and working memory. These cannabis-only users consumed an average of 63 joints per month, and had been abstinent for 24 hours prior to testing. Finally, a study of 19 ecstasy (and cannabis) users, 19 cannabis-only users, and 19 drug naïve participants, failed to find any differences in memory performance between cannabis-only users and controls (Quednow et al., 2006). Cannabis-only users in this study had been using for an average of 6.6 years at a frequency of 4 times per week, and did not use cannabis for at least 3 days prior to testing.

Studies Focusing on Cannabis Users

Two studies by Pope, Gruber, Hudson, Huestis, Yurgelun-Todd (2001; 2002) assessed the impact of cannabis use on cognitive function during a 28-day period of

abstinence. In the first study, 63 current heavy (daily) cannabis users, who had consumed the substance at least 5000 times ever, were compared to 45 former heavy users, who had also used cannabis at least 5000 times ever, but had used 12 or less times in the past 3 months, and 72 participants in the control group, who had used no more than 50 times ever, and not more than once in past 12 months. Participants were assessed on days 0, 1, 7, and 28 of the abstinence period. On days 0-7, current heavy users scored significantly below controls on recall of word lists (i.e., total recall, long-term retrieval, and 30 min delayed recall), but not on long-term storage. By day 28, no significant differences were evident between the three groups. Thus, the authors suggested that the memory impairment seen in current heavy users on days 0-7 may have been due to either withdrawal effects or the residual effect of cannabinoids in the CNS; but that no relationship existed between cumulative lifetime use and performance on memory tasks (Pope et al., 2001).

In contrast, a study by Solowij et al. (2002) concluded that long-term cannabis use resulted in cognitive impairment which worsened with increased duration of regular use. In this study, cognitive functioning was assessed in 33 non-cannabis using controls, and 102 treatment-seeking near daily users, of which 51 were long-term users (mean duration, 24 years; current frequency, 27 days per month) and 51 were shorter-term users (10 years; 28 days per month). Cannabis users reported a mean of 17 hours abstinence from the substance. Long-term users were found to perform significantly worse than shorter-term users and controls on a verbal recall task, and worse than controls on retention and retrieval tasks, while no significant differences were evident between shorter-term users and controls. The authors noted that the cognitive impairment seen in long-term users did not indicate a 'severe memory problem', although this dysfunction may have potentially impacted on everyday functioning (Solowij et al., 2002, p. 1129)

The second study by Pope, Gruber, Hudson, Huestis, Yurgelun-Todd (2002) included 77 current heavy users and 87 controls, with participants defined as for the

previously mentioned study. Again, deficits were evident for current cannabis users on memory of word lists when assessed on days 0, 1, and 7 of abstinence, but not on day 28. The authors concluded that these findings indicated that the effects of cannabis use on cognition were reversible and related to recent exposure rather than lifetime use. They also noted that, as the residual effects of cannabis use included impaired memory function for 7 days after consumption, daily or near daily users would effectively experience continual cognitive impairment (Pope et al., 2002).

Bolla, Brown, Eldreth, Tate and Cadet (2002) also assessed study participants after a 28-day period of abstinence from cannabis, however their findings were not consistent with those of Pope et al. (2001; 2002). Bolla et al. evaluated three study groups: light users (n=7) who had been using cannabis for an average of 3.4 years, and were currently consuming an average of 11 joints per week, spread over 4 days; middle users (n=8) who had used cannabis for 5.4 years on average, and currently smoked an average of 42 joints per week, over 6 days of use; and heavy users (n=7) who had used cannabis for 5.3 years on average, and were daily users, consuming an average of 94 joints per week. Results from this study indicated that the number of joints consumed each week was negatively related to performance on some memory tasks (i.e., delayed recall for verbal memory, and visual memory). Heavy users also performed significantly worse than light users on information recall, but not on tasks related to memory acquisition or retention. However, similarly to Solowij et al. (2002), the authors noted that memory task performance by all three groups was not clinically abnormal (Bolla et al., 2002).

Similar findings to Pope et al. (2001; 2002) were evident in a study of 113 participants assessed since infancy as part of the Ottawa Prenatal Prospective Study (Fried, Watkinson, & Gray, 2005). For this study, participants were classified according to current cannabis use status and frequency of consumption: current heavy users (n = 19) consumed an average of 12 joints each week, had been using cannabis for an average of 2.6 years, and had smoked

1884 joints on average in their lifetime; current light users (*n* = 19) averaged 1 joint each week, and had consumed an average of 122 joints in the 1.8 years they had been using cannabis on average; former users (*n* = 16) had consumed an average of 2203 joints in their 2.2 years of using cannabis, but had not used cannabis regularly (weekly) in past 3 months, consuming 2 or less joints in past 2 months; and control group (*n* = 59) participants had never used cannabis regularly. All cannabis users were abstinent on the day of testing. Current heavy users were found to perform worse than nonusers on immediate and delayed memory tasks, while former users showed no apparent cognitive impairment. Thus, the authors concluded that while the residual effects of cannabis use were evident beyond acute intoxication, they were not apparent 3 months after the cessation of regular cannabis use.

Wadsworth et al. (2006) examined the effects of cannabis use on cognition within the context of work and everyday life by comparing 34 current cannabis users and 85 controls who had not consumed cannabis in the previous 12 months. Episodic, semantic, and working memory were assessed pre- and post-work on the first and last day of the working week. They found that current cannabis users did not typically perform worse than controls on delayed recognition memory (episodic memory), semantic recall (semantic memory), or immediate recall (episodic memory) tasks. However, a 'hangover' effect was detected at the first testing session (Monday pre-work), with working memory deficits evident in those who had used cannabis in the previous 24 hours. This deficit was not evident at other testing sessions, including the Monday post-work assessment. Current users also performed significantly worse than controls on the delayed recall task (episodic memory) at the pre-work assessment on Friday, probably reflecting greater cannabis use towards the end of the week.

In a third study by Pope et al. (2003), the impact of early onset of cannabis use on cognitive function was examined in 28-day abstinent long-term cannabis users. The 122 long-term heavy users involved in this study included both current and former heavy cannabis

users, as defined previously, who were compared to 87 control group participants. Long-term users were divided into two groups; early onset users, who initiated use before 17 years of age (n = 69), and late onset users, who were 17 years of age or older when they began using cannabis (n = 53). Early onset users performed significantly worse on delayed recall of word lists than late-onset users and controls; although these differences were not significant after adjustment for verbal intelligence. In contrast, late onset users did not differ from controls on this task. These findings did not change after analyses were repeated using different cut-offs for early onset of cannabis use, including: 16 years of age (53 early, 69 late), and 15 years of age (34 early, 88 late). The authors proposed three possible explanations for the findings: (i) early onset users may have lower innate cognitive abilities than the other groups; (ii) early onset users may have poorer verbal skills due to having attained lower levels of education than the other groups; or, (iii) the effects of cannabis use on the developing brain may be neurotoxic, perhaps permanently impacting on cognitive function in those who initiated use at an early age (Pope et al., 2003).

Thus, in summary, it is evident that there is a marked lack of consistency in the research findings describing associations between cannabis use and memory function. Klugman and Gruzelier (2003), after reviewing the relevant literature noted there was some evidence that cannabis use caused residual cognitive effects, and that these effects were likely to include impaired working memory, and deficits in both visual and verbal memory. Similarly, a meta-analysis including data from 704 cannabis users and 484 nonusers completed by Grant, Gonzalez, Carey, Natarajan, and Wolfson (2003) indicated that chronic users exhibited impaired memory task performance (although the authors noted that the effect sizes were small). Gonzalez, Carey and Grant (2002), however, could not find consistent evidence for persistent neuropsychological deficits in cannabis users, after reviewing 40 articles that met study inclusion criteria. Of the studies they reviewed, 55% reported at least some subtle cognitive impairment, with poorer performance most

frequently reported for the attention/working memory domain (45%); whereas 35% of the studies that looked at the forgetting domain reported significantly poorer performance for cannabis users. However, Gonzalez et al. (2002) believed that methodological limitations precluded any definitive conclusions being reached about the neuropsychological effects of cannabis use.

Methodological differences between studies such as the levels of cannabis use by participants, and the assessment measures employed, were also highlighted as potential causes of inconsistent research findings, by Solowij et al. (2002). Pope (2002), however, proposed that these differences were more likely due to confounding in relation to length of abstinence prior to testing, and the associated complications of withdrawal effects. Klugman and Gruzelier (2003) noted that cannabis withdrawal effects may also impact on cognitive function if the period of abstinence was inadequate, thus potentially confounding evaluations of the effects of cannabis use on cognitive function.

Studies Assessing 'Real World' Memory Function

As noted by both Solowij et al. (2002) and Bolla et al. (2002), laboratory-based neuropsychological differences found between cannabis users and non-users, or between different categories of cannabis users, may be statistically significant but fail to reach a level of clinical significance. That is, while there may be significant group differences or associations between the variables, this does not necessarily translate into real world functional differences that impact adversely on the abilities of affected individuals to fulfill their daily activities or meet their role responsibilities. Further, neuropsychological memory tests are designed to assess aspects of memory function in relative isolation. While a functional deficit in any one memory process may translate to impaired everyday functioning, the information gained from a neuropsychological assessment does not necessarily inform us

as to how an individual's memory processes work together when undertaking usual daily activities or navigating the 'real world'.

A number of studies have been designed to determine the impact of cannabis (or cannabis and ecstasy) use on real world memory function. For example, Rogers et al. (2001) completed an Internet-based study exploring the effects of cannabis and ecstasy use on self-reported memory function; 192 of the 490 participants had used cannabis in the previous month (Rodgers et al., 2001). Self-reported memory function was evaluated using the Everyday Memory Questionnaire (EMQ) (Sunderland, 1983) and the Prospective Memory Questionnaire (PMQ) (Hannon, Adams, Harrington, Fries-Dias, & Gipson, 1995). Frequency of cannabis use in the previous month was found to predict EMQ scores, and short-term and internally cued prospective memory score, but not long-term subscale scores on the PMQ. A further study by Rodgers et al. (2003), extended the data set from Rodgers et al. (2001) to include a total of 763 participants, of which 309 had used cannabis in the previous month. In this second study, frequency of cannabis use was again found to predict EMQ scores, but was not significantly related to long-term prospective memory on the PMQ. Compared to non-users (n = 451), participants using cannabis 5-20 times per month (n = 69) reported 10% more problems with everyday memory, while those using more than 20 times a month (n = 82) reported 19% more problems.

Heffernan, Jarvis, Rodgers, Scholey, and Ling (2001) examined self-reported cognitive impairment using the Cognitive Failures Questionnaire (CFQ) (Broadbent, Cooper, FitzGerald, & Parkes, 1982), with 15 ecstasy users (who also used cannabis), 15 regular cannabis users, and 15 nonusers of both substances. Cannabis-only users had an average duration of 11 years of use, consuming an average of 3 joints at each of 4 sessions per week. They had all been abstinent for 1 month prior to testing. No significant differences in CFQ total scores were found between these three groups. In contrast, Fisk and Montgomery (2008) found that cannabis users (n = 33) recorded significantly higher CFQ scores than

non-users (*n* = 29). The cannabis users had consumed an average of 4.3-4.5 joints per week, for approximately 4 years, but had been abstinent for a median of 4 weeks. Further, Fisk and Montgomery's cannabis using participants also recorded higher EMQ and PMQ scores than non-cannabis users.

Memory Function and Psychopathology

As noted in Chapter 1, impaired memory functioning is typically evident in people experiencing psychotic symptoms/disorders (e.g., schizotypy, schizophrenia, psychosis) and also in people with mood disorders (Austin, Mitchell, & Goodwin, 2001; Keefe & Hawkins, 2005). Further, as reported in Chapter 9, there is a high level of comorbidity between psychotic symptoms and depression in the present sample, which also supports findings of previous studies (Liraud & Verdoux, 2002; Spitznagel & Suhr, 2004).

D'Souza et al. (2005) found that the participants with schizophrenia who received a 2.5 mg or 5 mg dose of THC performed significantly worse on immediate and delayed recall tasks than the participants receiving a placebo. Similarly, Coulston et al. (2007) found that schizophrenic participants with a current cannabis use disorder tended to perform worse on a task assessing immediate memory than those without a cannabis use disorder. However, Potvin, Joyal, Pelletier and Stip (2007), who conducted a meta-analysis of 23 studies, consisting of a total of 1807 participants with schizophrenia, found that cannabis-using schizophrenia patients performed significantly better than nonusers on tasks assessing verbal memory. These differences in findings may be related to the lack of attention paid to differences between negative and positive symptomology. Deficits in prefrontal cognitive functions, such as impaired executive functioning, have been found to be associated with negative, but not positive, schizotypy (Dinn, Harris, Aycicegi, Greene, & Andover, 2002). However, as noted in Chapter 1, the impact of cannabis use on the 'normal' hypodopaminergic activity in the prefrontal cortex of individuals with high negative

schizotypy increases the level of neurotransmission, thus improving cognitive function. In contrast, the increased neurotransmission resulting from cannabis use negatively impacts on the hyperdopominergic state of individuals experiencing high positive symptomology, exacerbating their symptomology (Dinn et al., 2002).

Summary

As noted above, there is general consensus in the literature that the acute effects of cannabis consumption can impact upon memory function (Ranganathan & D'Souza, 2006). With regard to residual effects of use, the cannabis use factors that will most likely impact adversely on memory function appear to be the frequent consumption of cannabis, particularly daily or near daily use (which may be a function of dosage or dependence), and inter-related factors of cumulative lifetime use, such as duration of use, and early initiation of cannabis use. However, as the majority of past studies have focused on only one or two key aspects of cannabis use (e.g. frequency, duration of use, early onset), it is not possible to rule out the importance of other aspects, and overall patterns, of cannabis use in relation to explaining use-related cognitive dysfunction. Further, the literature exploring relationships between residual effects of cannabis use and memory function is inconsistent and contradictory; which may be due to methodological differences between studies and issues of research design (Grant et al., 2003; Pope, 2002; Solowij et al., 2002).

On reviewing the literature it is apparent that previous studies investigating the association between cannabis use and cognitive functioning have overlooked psychopathology as an important potential confound. In the present study, 19% of the participants were classified as depressed and 6% reported high levels of psychotic symptomology, hence, it would seem unlikely that psychopathology has not been an issue for at least some cannabis-using participants in past studies. Further, with the focus of past research primarily on neuropsychological assessments of cognitive functioning, little is

known about how cannabis use actually impacts upon a user's ability to function in 'real world' situations. This information is critical if we are to understand the way cannabis use actually affects the everyday functioning of cannabis users.

The present investigation will first report on the level everyday cognitive functioning of the participants and the severity of any impairment. This will be followed by a determination of the likelihood of the participants experiencing high levels of cognitive failures, with a specific focus on whether participants initiating cannabis use at an early age, or those engaging in heavy, prolonged or dependent use, were at a greater level of risk for experiencing cognitive failures than the participants who did engage in these pattern of use. The nature of the associations between everyday cognitive functioning and cannabis use factors will also be examined. While investigating these associations, it will be necessary to account for many potential confounding factors. The latter factors may include demographic data and lifestyle factors. Particular attention will be paid to psychopathology, and co-morbid drug and alcohol use. Additionally, due to the acute effects of cannabis use on cognitive functioning, recent cannabis use will need to be taken into account. However, it should be noted that as the participants were asked about previous memory and cognitive failures, rather than undertaking a real time neuropsychological assessment task, their level of cannabis intoxication at the time of participating in the study is not expected to have impacted overly on these measurements.

The final section of the present chapter provides a summary of all information presented here and a discussion of relevant issues, including comparison data to place the present study's sample population in context, both in relation to cannabis-using populations and the general population.

Everyday Cognitive Functioning

Measures of Everyday Cognitive Function

Cognitive Failures Questionnaire (CFQ)

The CFQ is a self-report measure of perceived frequency of cognitive slips in perception, memory and motor function (Broadbent et al., 1982). The CFQ has been described as a measure of 'real world' memory, which assesses the relationship between attentional performance and general cognitive functioning (Fisk & Montgomery, 2008). It consists of 25 statements rated, with reference to the previous four weeks, on a five-point scale, from 'never' to 'very often' (scoring range: 0-100). Four factors have been identified. The memory factor (8 items, scoring range: 0-32) assesses memory failures and forgetfulness. The distractibility factor (9 items, range: 0-36) assesses ability to successfully deal with perceptual aspects of divided-attention tasks. The blunders factor (7 items, range: 0-28) assesses errors related to motor function. And the final factor, names (2 items, range: 0-8), is assesses memory for names (Wallace, Kass, & Stanny, 2002). The CFQ has been found to be a valid and reliable (internal consistency, .79; test-retest reliability, .82) measure (Broadbent et al., 1982). The CFQ was found to have good internal consistency reliability, based on the data from participants in the present study (N = 989), for total score (α = .93) and all four factors (memory, α = .84; distractibility, α = .83; blunders, α = .76; names, α = .78).

Everyday and Prospective Memory (EMP)

The Everyday and Prospective Memory scale (EPM) consisted of items selected from the Everyday Memory Questionnaire (EMQ) (Sunderland, 1983) and the Prospective Memory Questionnaire (PMQ) (Hannon et al., 1995), and some specifically developed items. The initial 33 items included 15 items assessing everyday memory and 18 items assessing prospective memory. Data from the pilot test was analysed to determine the items for the

final version of the study questionnaire. Discarded items were those that correlated highly, were similar in wording, or related to similar situations, to those that were retained. Factor analysis indicated the presence of a single factor.

The final version of the EPM consisted of 15 items (7 everyday memory, 8 prospective memory), rated on a five-point scale ('never' to 'very often'), with a scoring range of 0-60. The internal reliability of this new scale was found to be high ($\alpha = .94$), based on data from participants in the present study ($N = 989$). The EPM total score correlates significantly with all CFQ scores while also retaining unique variance: CFQ total score, $r = .84$, $p < .001$, $r^2 = .70$; memory factor, $r = .80$, $p < .001$, $r^2 = .64$; distractibility factor, $r = .78$, $p < .001$, $r^2 = .60$; blunders factor, $r = .74$, $p < .001$, $r^2 = .54$; names factor, $r = .48$, $p < .001$, $r^2 = .23$.

Levels of Cognitive Functioning

CFQ Total Score

The mean CFQ total score for the participants ($N = 989$) was 35.00 ($SD = 15.90$). A two-way ANOVA indicated a small gender effect, $F(1, 988) = 22.22$, $p <.001$, $\eta^2 = .022$, with female participants ($M = 38.06$, $SD = 17.32$) reporting significantly higher number of cognitive failures than male participants ($M = 33.16$, $SD = 14.69$). A small age effect was also indicated: $F(4, 988) = 5.61$, $p <.001$, $\eta^2 = .022$ (see Appendices K1 & K2). A post hoc Tukey's HSD analysis (see Appendix K3) indicated that participants aged in their teens ($M = 38.71$, $SD = 16.99$) reported significantly more cognitive failures than participants who were in their mid-late twenties ($M = 32.74$, $SD = 15.25$) and the participants who were over 40 years of age ($M = 32.72$, $SD = 14.88$).

CFQ Factor Scores

Memory Factor. The mean memory factor score for the participants (N = 989) was 8.20 (SD = 5.50). A two-way ANOVA indicated a small gender effect, $F(1, 988) = 15.22$, $p < .001$, $\eta^2 = .015$, with female participants (M = 9.04, SD = 6.01) reporting significantly higher number of memory failures than male participants (M = 7.69, SD = 5.11). A small age effect was also indicated: $F(4, 988) = 5.40$, $p < .001$, $\eta^2 = .021$ (see Appendices K4 & K5). A post hoc Tukey's HSD analysis (see Appendix K6) indicated that participants aged in their teens (M = 9.55, SD = 6.24) reported significantly more memory failures than participants in their mid-late twenties (M = 7.36, SD = 5.29) and thirties (M = 7.62, SD = 4.79).

Distractibility Factor. The mean distractibility factor score for the participants (N = 989) was 14.96 (SD = 6.25). A two-way ANOVA indicated a medium gender effect, $F(1, 988) = 36.81$, $p < .001$, $\eta^2 = .035$, with female participants (M = 18.36, SD = 7.53) reporting a significantly higher amount of distractibility-related cognitive failures than male participants (M = 15.91, SD = 5.65). A medium age effect was also indicated: $F(4, 988) = 9.62$, $p < .001$, $\eta^2 = .036$ (see Appendices K7 & K8). A post hoc Tukey's HSD analysis (see Appendix K9) indicated that participants aged in their teens (M = 16.87, SD = 6.54) reported significantly more distractibility problems than participants in their mid-late twenties (M = 14.06, SD = 5.89), thirties (M = 14.17, SD = 5.83), and over forties (M = 13.45, SD = 5.65). Participants aged in their early twenties (M = 16.10, SD = 6.61), also reported significantly more distractibility issues than participants in their mid-late twenties and those aged over 40 years of age.

Blunders Factor. The mean blunders factor score for the participants (N = 989) was 8.96 (SD = 4.71). A two-way ANOVA indicated a small gender effect, $F(1, 988) = 20.65$, $p < .001$, $\eta^2 = .020$, with female participants (M = 9.87, SD = 5.20) reporting a significantly higher numbers of blunders than male participants (M = 8.41, SD = 4.31). A small age effect

was also indicated: $F(4, 988) = 4.24$, $p = .002$, $\eta^2 = .017$ (see Appendices K10 & K11). A post hoc Tukey's HSD analysis (see Appendix K12) indicated that participants aged in their teens ($M = 9.96$, $SD = 4.87$) reported significantly higher scores on the blunders factor than the participants who were over 40 years of age ($M = 8.16$, $SD = 4.49$).

Names Factor. The mean memory for names factor score for the participants ($N = 989$) was 3.83 ($SD = 2.12$). A two-way ANOVA indicated that there were no significant gender, age, or interaction effects (see Appendices K13 & K14).

To allow direct comparison between the CFQ total and factor scores, the mean scores for each were converted into percentage scores (see Figure 10.1). It is evident in this figure that participants were most likely to have experienced problems with their memory for names and experienced distractibility-related cognitive failures. However, the participants mean scores for all variables were relatively low.

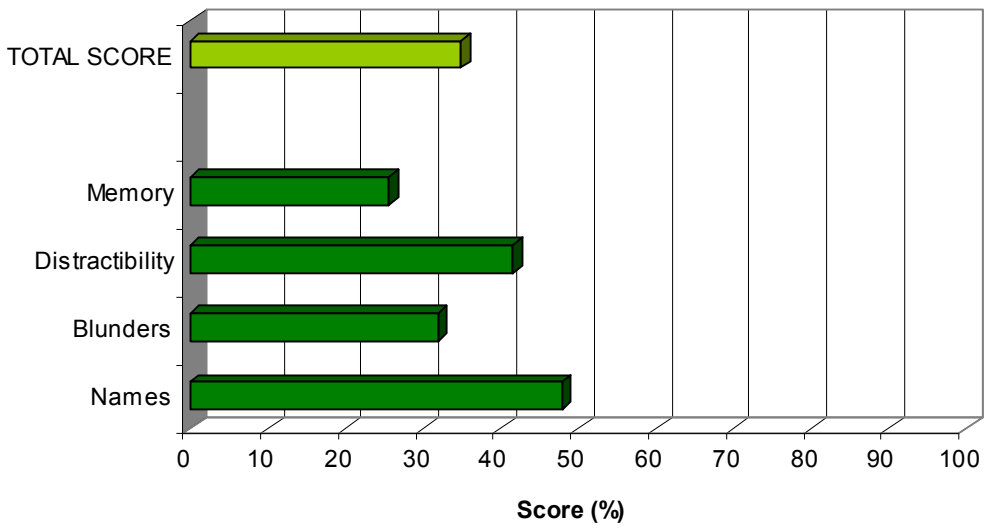

Figure 10.1. Mean total and factor scores (expressed as percentages)

EPM Total Score

The mean EPM score for the participants (N = 989) was 16.93 (SD = 10.12). A two-way ANOVA indicated a small gender effect, $F(1, 988) = 19.63$, $p < .001$, $\eta^2 = .019$, with female participants (M = 18.69, SD = 10.67) reporting significantly higher numbers of everyday and prospective memory problems than male participants (M = 15.88, SD = 9.63). A small age effect was also indicated: $F(4, 988) = 6.02$, $p < .001$, $\eta^2 = .023$ (see Appendices K15 & K16). A post hoc Tukey's HSD analysis (see Appendix K17) indicated that participants aged in their teens (M = 19.28, SD = 11.20) recorded significantly higher EPM scores than participants who were in their mid-late twenties (M = 15.34, SD = 9.57) and thirties (M = 15.67, SD = 9.15).

Severity of Cognitive Deficits

Clinical Groups

Wagle, Berrios, and Ho (1999) investigated CFQ scores with three different clinical groups. The first group (labeled 'organic') consisted of 209 participants diagnosed with an organic neurological condition; 85% Alzheimer's or frontal lobe dementia, 15% Huntington's or Parkinson's disease. The second group (labeled 'functional) consisted of 332 participants without organic conditions but who were diagnosed with depression or anxiety. The final group (labeled 'mixed') consisted of 115 participants with dementia who also reported depression or anxiety. The CFQ total scores from Wagle et al.'s study were compared to those for present study's depression groups using Coe's Effect Size Calculator (2006). These analyses indicated that the non-depressed participants in the present sample reported significantly fewer cognitive failures than all of Wagle et al.'s groups: organic, $p < .01$, *Cohen's* $d = .58$; functional, $p < .01$, $d = 1.09$; mixed, $p < .01$, *Cohen's* $d = 1.23$ (see Figure 10.2 and Appendix K18).

The moderate depression group was found to be statistically similar to the organic clinical group, while reporting significantly fewer cognitive failures than the functional and mixed groups: moderate vs. functional, $p < .01$, $d = 0.35$; moderate vs. mixed, $p < .01$, $d = 0.44$ (see Figure 10.2 and Appendix K18). In contrast, the severely depressed group in the present study was found to be statistically similar to Wagle et al.'s (1999) functional and mixed clinical groups, while reporting significantly more cognitive failures than the organic group: $p < .01$, $d = 0.38$ (see Figure 10.2 and Appendix K18).

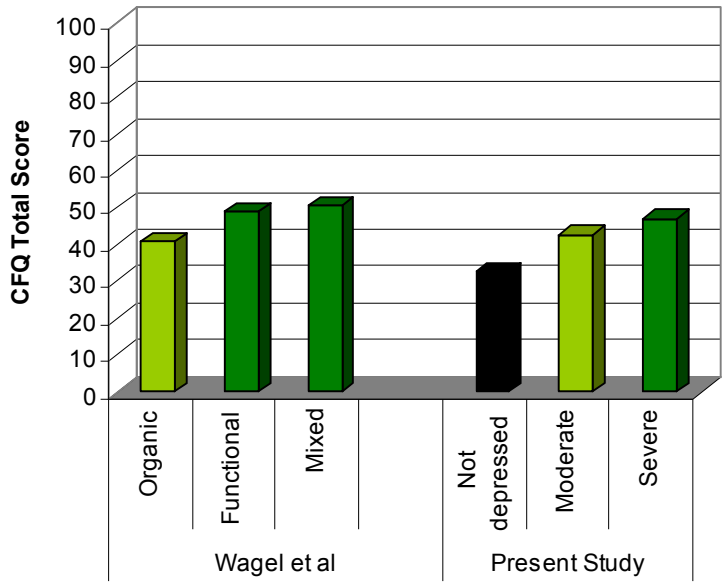

Figure 10.2. Comparison of CFQ total scores (same colour = not statistically different)

For the present sample, a significant progression was evident over the depression groups, with non-depressed participants recording significantly lower CFQ total scores than the two depressed groups, while the moderately and severely depressed participants did not differ significantly: $F(2, 988) = 49.94$, $p < .001$, $\eta^2 = .092$ (see Figure 10.2 and Appendices K19 & K20).

Non-Clinical Samples

Pfeifer, van Os, Hanssen, Delespaul, and Krabbendam (2008) employed the CFQ with a general population sample from the Netherlands (N = 755), while Wallace et al. (2002) assessed cognitive failures reported by undergraduate students and US Navy personnel. Coe's Effect Size Calculator (2006) was utilised for statistical comparison between the participants in the present study (N = 989) and the samples assessed by Pfeifer et al. and Wallace et al. These analyses indicated that the participants in the present study (M = 35.00, SD = 15.90) reported significantly fewer cognitive failures than Wallace et al.'s sample (M = 45.46, SD = 17.02; $p < .01$, *Cohen's* d = .52), but reported significantly more than Pfeifer et al.'s sample (M = 32.70, SD = 11.20; $p < .01$, d = .16). When the latter analysis was repeated with the data from only the non-depressed participants in the present study (n = 715; M = 31.85, SD = 14.45), the participants were found to be statistically similar to Pfeifer et al.'s sample (p = .21, d = .07).

Likelihood of Experiencing Cognitive Failures

Odds ratios were calculated to determine which lifestyle and cannabis use factors placed participants at a high level of risk for experiencing high levels of cognitive failures (see Table 10.1). The CFQ was not designed with a clinical cutpoint, however Wagle et al. (1999) suggested that a score of over 50 on the CFQ constituted a high level of cognitive failure. Using this cutpoint, participants were categorised into two groups; those who were classified as having with high levels of cognitive failures (N = 139; 'high' = 1), and those who were classified with low levels (N = 850; 'low/moderate' = 2). The dichotomised lifestyle and cannabis use factors were those previously utilised in Chapter 9.

Table 10.1
Participants Meeting Risk Factor Criteria and Odds Ratio for High Cognitive Failures

	High (*N* = 139)		**Low** (*N* = 850)			
	N	%	*N*	%	**OR**	**95% CI**
Key Cannabis Use Factors						
Early use	69	49.6 %	328	38.6 %	1.57 *	1.09 - 2.25
Daily use	95	68.3 %	565	66.5 %	1.09	0.74 - 1.60
Prolonged use	46	38.7 %	358	47.9 %	0.69	0.46 - 1.02
Dependent use	40	28.8 %	87	10.2 %	3.54 ***	2.31 - 5.44
Use in last 7 hours	53	38.1 %	271	31.9 %	1.32	0.91 - 1.91
Psychopathology						
Depressed	62	44.6 %	122	14.4 %	4.81 ***	3.27 - 7.07
High psychotic symptoms	24	17.3 %	35	4.1 %	4.86 ***	2.79 - 8.46
Current Lifestyle Factors						
Demographic & Environmental						
Female	74	53.2 %	298	35.1 %	2.11 ***	1.47 - 3.03
Young	77	55.4 %	329	38.7 %	1.97 ***	1.37 - 2.82
Single	97	69.8 %	481	56.6 %	1.77 **	1.20 - 2.61
Unemployed	26	18.7 %	123	14.5 %	1.36	0.85 - 2.17
Low SES (self)	115	82.7 %	611	71.9 %	1.87 **	1.78 - 2.98
Low education	55	39.6 %	218	25.6 %	1.90 **	1.31 - 2.76
Urban	38	27.3 %	239	28.1 %	0.96	0.64 - 1.44
Friends use cannabis	89	64.0 %	492	49.7 %	1.30	0.89 - 1.88
Individual						
High alcohol use	18	12.9 %	91	10.7 %	1.24	0.72 - 2.13
High tobacco use	79	56.8 %	384	40.9 %	1.90 ***	1.32 - 2.73
Poly-substance use	73	52.5 %	377	44.4 %	1.39	0.97 - 1.99
High sensation seeking	55	39.6 %	245	28.8 %	1.62 *	1.12 - 2.34
Poor health	67	48.2 %	326	38.4 %	1.50 *	1.04 - 2.14
Sleep problems	88	63.3 %	371	43.6 %	2.23 ***	1.54 - 3.23
Childhood Lifestyle Factors						
Environmental						
Sole parent family	31	22.3 %	190	22.4 %	1.00	0.65 - 1.53
Low SES (parental)	50	36.0 %	302	35.5 %	1.02	0.71 - 1.48
Family addiction	86	62.3 %	465	54.8 %	1.37	0.94 - 1.98

Table 10.1 continued

	High (*N* = 139)		**Low** (*N* = 850)			
	N	%	*N*	%	**OR**	**95% CI**
High conflict	26	19.1 %	152	18.1 %	1.07	0.67 - 1.69
Domestic violence	71	51.1 %	374	44.0 %	1.33	0.93 - 1.90
Death of someone close	49	35.3 %	267	31.4 %	1.19	0.82 - 1.73
Physical abuse	36	26.9 %	199	24.2 %	1.15	0.76 - 1.74
Sexual abuse	22	16.7 %	119	14.5 %	1.18	0.71 - 1.93
No adult support	71	51.1 %	338	39.8 %	1.58 *	1.10 - 2.27
Individual						
Early tobacco use	108	77.7 %	557	65.5 %	1.83 **	1.20 - 2.80
Early alcohol use	76	54.7 %	391	46.0 %	1.42	0.99 - 2.03
Early substance use	18	12.9 %	103	12.1 %	1.08	0.63 - 1.84
High delinquent behaviour	67	48.2 %	241	28.4 %	2.35 ***	1.63 - 3.39
Ran away from home	48	34.5 %	228	26.8 %	1.44	0.98 - 2.11
Childhood psychopathology	86	62.3 %	386	45.8 %	1.96 ***	1.35 - 2.84
ADD/ADHD	26	19.0 %	133	15.8 %	1.25	0.78 - 1.99

* $p < .05$, ** $p < .01$, *** $p < .001$

Daily users and participants who had consumed cannabis in the 7 hours prior to completing the questionnaire were not found to differ in level of cognitive failures from the participants who did not engage in these patterns of use (see Table 10.1) However, participants who met proxy cannabis dependence criteria were significantly more likely to experience a high level of cognitive failures than those that were not dependent, and early initiators were also slightly more likely to have reported high levels of cognitive failures that participants who had not used cannabis before the age of 16 years. Higher levels of risk were associated with current depression (as measured by the MHI-5) and high level psychotic symptomology (as measured by the SPQ-B).

Demographically, participants were at an increased level of risk for experiencing a high level of cognitive failures if they were female, young, single, had a low level of

education, and a low proxy SES. While daily tobacco users were more likely to report high level cognitive failures than non-daily smokers, high level alcohol and poly-substance use were not associated with an increased likelihood of these cognitive issues. However, participants reporting sleep problems were significantly more likely to have experienced cognitive failures than non affected participants. Further, engaging in delinquent behaviour and experiencing psychopathology during childhood/adolescence were associated with higher levels of risk for experiencing cognitive failures.

Factors Associated with Cognitive Functioning

As a further step towards understanding the nature of the association between cannabis use and everyday cognitive functioning, preliminary correlation analyses were completed between the cannabis use factors and the CFQ memory and distractibility factors and EPM scores. Correlation analyses were also completed between these CFQ factors and EPM score with both childhood and current lifestyle factors to identify potentially confounding variables (see Appendix K21). Variables found to be significantly associated with the CFQ factors and EPM score were then entered into stepwise multiple regression analyses. For each of the CFQ factors and EPM score, initially four multiple regression analyses were completed; one each for cannabis use factors, childhood lifestyle factors, and current lifestyle factors, with the fourth multiple regression containing the variables that were significantly indicated in the prior analyses as being associated with the cognitive function variables. A final multiple regression contained the key variables indicated in the fourth multiple regression and associated psychopathology, motives for cannabis use, and subjective experiences of cannabis use (see Appendix K21) to determine the role played by these variables.

CFQ Memory Factor

The first stepwise multiple regression analysis, investigating associations between memory factor scores and cannabis use factors, included 10 variables: proxy dependence, number of proxy dependence criteria, weekly dose group, weekly number of cones/joints, proportion of cannabis in cones/joints, strength of cones/joints, concurrent tobacco and substance use, and normal and highest levels of intoxication. The three variables retained in the final regression model (number of proxy dependence criteria, highest level of intoxication, and proportion of cannabis) explained 13% of the variance in memory factor scores: $F(3, 726) = 36.17$, $p < .001$ (see Table 10.2 and Appendix K22). The second and third stepwise multiple regression analyses, investigating associations with current and childhood lifestyle factors (respectively), identified six current (gender, highest level of education, frequency of tobacco and alcohol use, sensation seeking, and sleep and health problems) and one childhood (delinquent behaviour) lifestyle factors as potential confounds (see Table 10.2 and Appendix K22).

The fourth stepwise multiple regression analysis contained all 10 of the variables identified through the previous analyses as being significantly associated with memory factor scores. Seven of these variables were retained in the final regression model, explaining 20% of the variance in memory factor scores: $F(7, 757) = 28.39$, $p < .001$ (see Table 10.2 and Appendix K23). Three cannabis use factors were retained in the latter regression model: number of proxy dependence criteria, highest level of intoxication, and proportion of cannabis is cones/joints. However, only the proportion of cannabis continued to explain a significant proportion of memory score variance after psychopathology (MHI-18 depression and anxiety subscales, and SPQ-B cognitive-perceptual factor), motives for use (external influences motives), and subjective experience (psychopathological experiences and physiological effects) variables included in the final regression analysis (see Table 10.2 and Appendix K22).

Table 10.2
Multiple Regression on Memory Factor Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Cannabis Use Factors (*Adj.* R^2 = .127)						
No. of proxy dependence criteria	0.92	0.13	0.26	7.29	<.001	.064
Proportion of cannabis	- 3.21	0.83	- 0.14	- 3.84	<.001	.018
Highest level of intoxication	0.67	0.18	0.13	3.72	<.001	.017
Current Lifestyle Factors (*Adj.* R^2 = .109)						
Highest level of education	- 0.94	0.16	- 0.18	- 5.94	<.001	.032
Sleep problems	0.77	0.18	0.14	4.41	<.001	.018
Gender	- 1.51	0.35	- 0.13	- 4.26	<.001	.016
Sensation seeking	0.13	0.04	0.12	3.72	<.001	.013
Alcohol use	0.40	0.13	0.09	3.00	.003	.008
Tobacco use	0.21	0.08	0.08	2.74	.006	.007
Childhood Lifestyle Factors (*Adj.* R^2 = .042)						
Delinquent behaviour	0.18	0.03	0.21	6.66	<.001	.043
Fourth Regression Model (*Adj.* R^2 = .204)						
No. of proxy dependence criteria	0.68	0.23	0.19	5.57	<.001	.033
Delinquent behaviour	0.14	0.03	0.17	4.75	<.001	.024
Proportion of cannabis	- 3.32	0.78	- 0.14	- 4.28	<.001	.019
Highest level of education	- 0.69	0.17	- 0.13	- 4.02	<.001	.017
Gender	- 1.49	0.39	- 0.13	- 3.87	<.001	.016
Highest level of intoxication	0.67	0.17	0.13	3.85	<.001	.016
Sensation seeking	0.11	0.04	0.09	2.74	.006	.008
Psychopathology Variables (*Adj.* R^2 = .173)						
MHI-18 anxiety subscale	0.67	0.09	0.23	7.36	<.001	.045
MHI-18 depression subscale	0.07	0.01	0.20	5.26	<.001	.023
SPQ-B cognitive-perceptual factor	0.05	0.02	0.11	3.03	.003	.008
Motive & Experience Factors (*Adj.* R^2 = .183)						
Psychopathological experiences	0.49	0.09	0.21	5.46	<.001	.033
Physiological effects	0.21	0.04	0.18	4.85	<.001	.027
External influence motives	0.26	0.06	0.17	4.61	<.001	.024
Final Regression Model (*Adj.* R^2 = .289)						
SPQ-B cognitive-perceptual factor	0.55	0.10	0.19	5.70	.003	.032
Physiological effects	0.20	0.04	0.17	5.07	<.001	.025
MHI-18 depression	0.05	0.01	0.16	4.54	<.001	.020
Delinquent behaviour	0.11	0.03	0.12	3.73	<.001	.017
External influence motives	0.19	0.05	0.12	3.45	.001	.012
Proportion of cannabis	- 2.43	0.74	- 0.11	- 3.29	.001	.011

In the final regression model, positive psychotic symptomology (SPQ-B cognitive-perceptual factor) accounted for the highest proportion of variance in CFQ memory factor scores. Physiological effects of cannabis use (e.g., red eyes, dry throat/mouth, lack of coordination), MHI-18 depression scores, childhood/adolescent delinquent behaviour, and external influence motives, also contributed to the 29% of memory factor score variance explained by the six variables. Interestingly, the proportion of cannabis that was in the participants' typical cones/joints was negatively associated with memory failure scores.

CFQ Distractibility Factor

The first stepwise multiple regression analysis, investigating associations between distractibility factor scores and cannabis use factors, included 12 variables: proxy dependence, number of proxy dependence criteria, duration of use, weekly dose group, weekly number of cones/joints, proportion of cannabis in cones/joints, strength of cones/joints, concurrent tobacco, alcohol, and substance use, and normal and highest levels of intoxication. The four variables retained in the final regression model (number of proxy dependence criteria, normal level of intoxication, proportion of cannabis, and concurrent alcohol use) explained 15% of the variance in distractibility factor scores: $F(4, 723) = 31.68$, $p < .001$ (see Table 10.3 and Appendix K22). The second and third stepwise multiple regression analyses, investigating associations with current and childhood lifestyle factors (respectively), identified six current (gender, proxy SES, highest level of education, sensation seeking, frequency of alcohol use, and self-identified sleep problems) and two childhood (psychopathology and delinquent behaviour) lifestyle factors as potential confounds (see Table 10.3 and Appendix K22).

Table 10.3
Multiple Regression on Distractibility Factor Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Cannabis Use Factors (*Adj.* R^2 = .145)						
No. of proxy dependence criteria	1.04	0.14	0.26	7.33	<.001	.064
Normal level of intoxication	0.86	0.19	0.16	4.62	<.001	.025
Concurrent alcohol use	1.25	0.36	0.12	3.45	.001	.014
Proportion of cannabis	- 3.25	0.95	- 0.12	- 3.42	.001	.014
Current Lifestyle Factors (*Adj.* R^2 = .170)						
Gender	- 2.56	0.39	- 0.20	- 6.53	<.001	.036
Self-identified sleep problems	1.14	0.19	0.18	5.96	<.001	.030
Alcohol use	0.85	0.15	0.17	5.90	<.001	.029
Sensation seeking	0.21	0.04	0.16	5.44	<.001	.025
Highest level of education	- 0.93	0.18	- 0.16	- 5.10	<.001	.022
Proxy SES (self)	0.44	0.14	0.10	3.22	.001	.009
Childhood Lifestyle Factors (*Adj.* R^2 = .058)						
Childhood psychopathology	1.10	0.19	0.18	5.64	<.001	.031
Delinquent behaviour	0.15	0.03	0.15	4.82	<.001	.023
Fourth Regression Model (*Adj.* R^2 = .268)						
No. of proxy dependence criteria	0.83	0.13	0.21	6.30	<.001	.039
Gender	- 2.54	0.43	- 0.19	- 5.92	<.001	.034
Alcohol use	0.75	0.16	0.15	4.81	<.001	.023
Sensation seeking	0.20	0.04	0.16	4.74	<.001	.022
Highest level of education	- 0.78	0.19	- 0.13	- 4.08	<.001	.016
Proportion of cannabis	- 3.47	0.87	- 0.13	- 4.00	<001	.016
Normal level of intoxication	0.59	0.18	0.11	3.33	.001	.011
Sleep problems	0.71	0.22	0.11	3.25	.001	.010
Childhood psychopathology	0.66	0.21	0.11	3.10	.002	.009
Psychopathology Variables (*Adj.* R^2 = .277)						
SPQ-B cognitive-perceptual factor	0.78	0.10	0.23	7.68	<.001	.043
MHI-18 depression subscale	0.07	0.02	0.18	4.94	<.001	.018
SPQ-B interpersonal factor	0.39	0.09	0.15	4.60	<.001	.015
MHI-18 anxiety subscale	0.08	0.02	0.15	4.27	<.001	.013
Motive & Experience Factors (*Adj.* R^2 = .243)						
Psychopathological experiences	0.68	0.10	0.25	6.86	<.001	.049
Physiological effects	0.29	0.05	0.22	5.88	<.001	.036
External influence motives	0.31	0.06	0.18	4.95	<.001	.026

Table 10.3 continued

	B	*SE B*	β	*t*	*p*	sr^2
Final Regression Model (*Adj.* R^2 = .423)						
Gender	- 2.16	0.38	- 0.17	- 5.65	<.001	.025
Physiological effects	0.23	0.04	0.17	5.24	<.001	.022
Sensation seeking	0.19	0.04	0.15	4.99	<.001	.020
SPQ-B cognitive-perceptual factor	0.53	0.11	0.16	4.98	<.001	.020
MHI-18 depression subscale	0.06	0.01	0.16	4.68	<.001	.017
SPQ-B interpersonal factor	0.39	0.09	0.15	4.35	<.001	.015
External influence motives	0.21	0.06	0.12	3.90	<.001	.012
Alcohol use	0.49	0.14	0.10	3.55	<.001	.010
Proportion of cannabis	- 2.24	0.77	- 0.09	- 2.93	.004	.007
Psychopathological experiences	0.25	0.09	0.10	2.76	.006	.006

The fourth stepwise multiple regression analysis contained all 12 of the variables identified through the previous analyses as being significantly associated with interpersonal factor scores. Nine of these variables were retained in the final regression model, explaining 27% of the variance in distractibility factor scores: $F(9, 746) = 31.35$, $p < .001$ (see Table 10.3 and Appendix K22). Three cannabis use factors were retained in the latter regression model: number of proxy dependence criteria, normal level of intoxication, and proportion of cannabis is cones/joints. However, only the proportion of cannabis continued to explain a significant proportion of distractibility score variance after psychopathology (MHI-18 depression and anxiety subscales, and SPQ-B cognitive-perceptual and interpersonal factors), motives for use (external influences motives), and subjective experience (psychopathological experiences and physiological effects) variables included in the final regression analysis (see Table 10.3 and Appendix K22). Interestingly, female gender accounted for the highest proportion of variance in CFQ distractibility factor scores. Physiological and psychopathological effects of use, sensation seeking, positive and negative psychotic

symptomology, depression, external influence motives, and frequency of alcohol use, also contributed to the 42% of distractibility factor score variance explained by the 10 variables. As previously, the association with the proportion of cannabis that was in the participants' typical cones/joints was negative in direction.

EPM Score

The first stepwise multiple regression analysis, investigating associations between EPM scores and cannabis use factors, included 11 variables: proxy dependence, number of proxy dependence criteria, duration of use, weekly dose group, weekly number of cones/joints, proportion of cannabis in cones/joints, strength of cones/joints, concurrent tobacco and substance use, and normal and highest levels of intoxication. The three variables retained in the final regression model (number of proxy dependence criteria, highest level of intoxication, and proportion of spin) explained 14% of the variance in EPM scores: $F(3, 726) = 40.68$, $p < .001$ (see Table 10.4 and Appendix K22). The second and third stepwise multiple regression analyses, investigating associations with current and childhood lifestyle factors (respectively), identified seven current (gender, unemployed, highest level of education, frequency of tobacco and alcohol use, sensation seeking, and sleep problems) and two childhood (psychopathology and delinquent behaviour) lifestyle factors as potential confounds (see Table 10.4 and Appendix K22).

The fourth stepwise multiple regression analysis contained all 10 of the variables identified through the previous analyses as being significantly associated with EPM scores. Nine of these variables were retained in the final regression model, explaining 24% of the variance in EPM scores: $F(9, 752) = 27.78$, $p < .001$ (see Table 10.4 and Appendix K23). Two cannabis use factors were retained in the latter regression model: number of proxy dependence criteria, and highest level of intoxication.

Table 10.4
Multiple Regression on EPM Scores

	B	*SE B*	*β*	*t*	*p*	sr^2
Cannabis Use Factors (*Adj.* R^2 = .141)						
No. of proxy dependence criteria	1.88	0.23	0.29	8.18	<.001	.079
Highest level of intoxication	1.45	0.33	0.15	4.40	<.001	.023
Proportion of cannabis	- 4.10	1.52	- 0.09	- 2.70	.007	.009
Current Lifestyle Factors (*Adj.* R^2 = .115)						
Highest level of education	- 1.63	0.29	- 0.17	- 5.64	<.001	.029
Sleep problems	1.53	0.32	0.15	4.77	<.001	.020
Gender	- 2.98	0.65	- 0.14	- 4.62	<.001	.019
Sensation seeking	0.24	0.06	0.12	3.70	<.001	.012
Alcohol use	0.83	0.24	0.11	3.42	.001	.010
Unemployed	2.30	0.87	0.08	2.65	.008	.006
Tobacco use	0.37	0.14	0.08	2.63	.009	.006
Childhood Lifestyle Factors (*Adj.* R^2 = .056)						
Delinquent behaviour	0.33	0.05	0.21	6.59	<.001	.042
Childhood psychopathology	1.05	0.32	0.11	3.35	.001	.011
Fourth Regression Model (*Adj.* R^2 = .243)						
No. of proxy dependence criteria	1.46	0.22	0.23	6.67	<.001	.044
Highest level of intoxication	1.51	0.31	0.16	4.85	<.001	.024
Delinquent behaviour	0.26	0.05	0.17	4.83	<.001	.023
Alcohol use	1.08	0.25	0.14	4.25	<.001	.018
Gender	- 2.94	0.69	- 0.14	- 4.24	<.001	.018
Highest level of education	- 0.93	0.31	- 0.10	- 3.02	.003	.009
Unemployed	2.62	0.91	0.10	2.88	.004	.008
Sleep problems	0.98	0.34	0.09	2.88	.004	.008
Sensation seeking	0.19	0.07	0.09	2.73	.006	.008
Psychopathology Variables (*Adj.* R^2 = .218)						
SPQ-B cognitive-perceptual factor	1.32	0.16	0.14	8.05	<.001	.051
MHI-18 depression subscale	0.16	0.02	0.24	6.65	<.001	.035
MHI-18 anxiety subscale	0.09	0.03	0.11	3.16	.002	.008
Motive & Experience Factors (*Adj.* R^2 = .243)						
Psychopathological experiences	0.95	0.16	0.22	6.02	<.001	.038
Physiological effects	0.40	0.08	0.19	5.12	<.001	.027
External influence motives	0.48	0.10	0.17	4.72	<.001	.023
Self-medication motives	0.39	0.11	0.12	3.43	.001	.012

Table 10.4 continued

	B	*SE B*	*β*	*t*	*p*	sr^2
Final Regression Model (*Adj.* R^2 = .361)						
MHI-18 depression subscale	0.12	0.02	0.20	6.05	<.001	.032
SPQ-B cognitive-perceptual factor	0.94	0.17	0.18	5.59	<.001	.028
Physiological effects	0.39	0.07	0.18	5.57	<.001	.028
Delinquent behaviour	0.22	0.05	0.14	4.52	<.001	.018
External influence motives	0.40	0.09	0.15	4.32	<.001	.016
No. of proxy dependence criteria	0.73	0.21	0.12	3.42	.001	.010
Gender	- 1.87	0.63	- 0.09	- 2.97	.003	.008
Alcohol use	0.66	0.23	0.09	2.85	.004	.007

However, only the number of proxy dependence criteria endorsed by the participants continued to explain a significant proportion of distractibility score variance after psychopathology (MHI-18 depression and anxiety subscales, and SPQ-B cognitive-perceptual factors), motives for use (self-medication and external influences motives), and subjective experience (psychopathological experiences and physiological effects) variables were included in the final regression analysis (see Table 10.4 and Appendix K22). MHI-18 depression scores accounted for the highest proportion of variance in EPM scores in the final regression model. Positive psychotic symptomology, physiological effects of use, delinquent behaviour during childhood/adolescence, external influence motives, frequency of alcohol use, and female gender, also contributed to the 36% of EPM score variance explained by the eight variables.

In summary, cannabis use factors explained modest amounts of the variance in CFQ memory (13%) and distractibility (15%) factor scores, and EPM scores (14%), but explained less variance than psychopathology variables (memory, 17%; distractibility, 28%; EPM, 22%). When lifestyle factors were included in the regression analyses with the cannabis use factors, the number of proxy dependence criteria endorsed by the participants continued to be

significantly associated with all three cognitive functioning variables, as were levels of intoxication (highest level for memory and EPM, normal level for distractibility), while significant negative associations were indicated for the proportion of cannabis in cones/joints with both CFQ factor scores. However, after the addition of psychopathological, motives for use, and experiences of use, variables, only one cannabis use factor was found to explain unique variance for each cognitive functioning variable: the number of proxy dependence criteria continued to explain a significant proportion of EPM scores, while the negative association with the proportion of cannabis in cones/joints was still significant for both CFQ factors.

Summary & Discussion

The objective of the present chapter was to investigate the nature of the association between cannabis use and everyday cognitive functioning. This included determining the likelihood of users experiencing cognitive failures, and the severity with which these problems were experienced.

Severity of Cognitive Impairment & Impact on Everyday Functioning

Although the participants as a whole had a mid-range level of cognitive failures in comparison to the non-clinical groups assessed by Pfeifer (2008) and Wallace et al. (2002), it was clear that the participants classified as being depressed (in Chapter 9) experienced substantially higher numbers of cognitive failures than the non-depressed participants. However, it was surprising to find that the participants in the present study who were classified with moderate depression experienced comparable levels of cognitive failures to Wagle et al.'s (1999) clinical sample of participants diagnosed with an organic neurological conditions. Less surprising was the similarity between the present study's severely depressed

participants and Wagle et al's functional group, as the latter group consisted of participants who were diagnosed with depression or anxiety.

A total of 14% of the participants were classified with high level cognitive failures. For these 139 participants, their level of cognitive failures would have a negative impact of their ability to function in their daily life. The participants most likely to report high levels of cognitive failures were young, single, females, who were tobacco smokers, with a low level of education, and a low proxy SES. They were classified in the present study with proxy cannabis dependence, depression, and high levels of psychotic symptomology. These participants reported experiencing psychopathology and engaging in delinquent behaviour during childhood/adolescence, and they reported current sleep problems.

When cognitive impairment is included in the estimates of everyday functioning discussed in Chapter 9, it is apparent that 28% of the participants are likely to have experienced some level of dysfunction in relation to their ability to fulfill their usual daily activities and meet their responsibilities (see Table 10.5). It is also evident that the female participants are much more likely to be affected than the male participants; with 35% of females likely to encounter some level of impairment in their everyday functioning, in comparison to 23% of males. However, most of the impairment in everyday functioning is depression-related, and only a small proportion of the functional deficits could be considered to be related to the participants' cannabis use (see Table 10.5).

Table 10.5
Participants by Cognitive Function, Psychopathology and Proxy Dependence

	Females (*N* = 372)	**Males** (*N* = 617)	**All** (*N* = 989)
High cognitive failures only	7.8 %	3.6 %	5.2 %
Plus proxy dependence	2.2 %	1.8 %	1.9 %
Plus depression	4.0 %	2.1 %	2.8 %
Plus psychotic symptoms	0.8 %	0.3 %	0.5 %
Plus proxy dependence & depression	2.4 %	1.3 %	1.7 %
Plus proxy dependence & psychotic symptoms	0.3 %	0.2 %	0.2 %
Plus depression & psychotic symptoms	1.2 %	1.3 %	1.5 %
Plus proxy dependence, depression & psychotic symptoms	0.5 %	0.0 %	0.2 %
ALL HIGH COGNITIVE FAILURES	**19.2 %**	**10.6 %**	**14.0 %**
All other high psychotic symptomology	3.0 %	3.9 %	3.5 %
Proxy dependence & depression	2.7 %	1.1 %	1.7 %
Depression only	9.9 %	7.5 %	8.4 %
ALL WITH IMPAIRED DAILY FUNCTIONING	**34.8 %**	**23.1 %**	**27.6 %**
Proxy dependence only	5.4 %	7.1 %	6.5 %
No Disorders	59.1 %	69.9 %	65.8 %
ALL WITH NORMAL DAILY FUNCTIONING	**64.5 %**	**77.0 %**	**72.3 %**

Relationship between Cannabis Use and Cognitive Functioning

The odds ratio analysis indicated that early initiation of cannabis use put participants at a slightly higher risk of experiencing high levels of cognitive failure than participants who did not use cannabis before the age of 16 years. However, this association was not evident in the final regression models investigating CFQ memory and distractibility factor scores and the EPM total score. This lack of significant association supports Pope et al.'s (2003) findings, where early initiation of cannabis use was not found to be significantly associated

with cognitive deficits after controlling for other factors. Early onset of use is linked to duration of use via the latter's association with the current age of participants. As noted above, younger age was associated with an increased level of risk of experiencing high levels of cognitive failures; however, this association was not significant after controlling for other current lifestyle factors. Duration of cannabis use was also not found to be associated with cognitive function in the present study. This supports findings by Pope et al. (2001) but not those of Solowij et al. (2002), where long-term users were found to have significantly lower levels cognitive function than short-term users.

Bolla et al. (2002) found that more frequent and heavier use (more joints per week) was associated with greater cognitive impairment. Similarly, Fried et al. (2005) found that heavy users performed significantly less well on memory tasks than light users. In contrast, Simon and Mattick (2002) found that the frequency with which cannabis was consumed was not significantly associated with memory function. In the present study, neither frequency of use nor the number of cones consumed per week, were found to be associated with cognitive functioning; thus support the findings of Simon and Mattick. However, in the present study, both the frequency of use and the number of cones/joints consumed per week explained significantly proportions of variance in the number of proxy dependence criteria endorsed by the participants (see Chapters 7 & 9). Further, in the present chapter, participants classified with proxy cannabis dependence were significantly more likely to experience cognitive failures than non-dependent participants, and the number of proxy dependence criteria endorsed by participants was found to be significantly associated with all three cognitive variables (CFQ memory and distractibility factors and EPM score). While, the association with the CFQ factors was not significant after controlling for psychopathology, motives for use, and subjective experiences of cannabis use, the number of proxy dependence criteria endorsed by participants explained a significant proportion of variance in EPM scores in the final regression model. The only cannabis use factors retained in the final regression models

for both the CFQ memory and distractibility factors was the proportion of cannabis in typical cones/joints and number of cones/joints consumed by the participants: a negative association between the variables. This finding may be evidence of participants with more cognitive impairment titrating their cannabis dose by including more tobacco; however, it possible that the psychopharmacological effects of smoking the two substances together is associated with the cognitive impairment.

To reiterate, initial regression analyses indicated that cannabis use factors explained modest amounts of the variance in CFQ memory (13%) and distractibility (15%) factor scores, and EPM scores (14%), but only two cannabis use factors were significantly associated with cognitive function after other variables were taken into account: proportion of cannabis in joints/cones (for both CFQ factors), and the number of proxy dependence criteria endorsed by the participants (for EPM). Further, the amount of variance in cognitive variable scores explained in the final regression models by the respective cannabis use factor was small: 1.1% of memory score variance, 0.7% of distractibility score variance, and 1.0% of variance in EPM scores. Therefore, after controlling for potential confounding factors, it appears that the cannabis use factors assessed in the present study do not have a strong relationship with everyday cognitive functioning.

In total, 29% of the variance in CFQ memory factor scores was explained by SPQ-B cognitive-perceptual scores, physiological effects of cannabis use, MHI-18 depression scores, childhood/adolescent delinquent behaviour, external influences motives for use, and the proportion of cannabis in typical cones/joints. While 42% of variance in CFQ distractibility scores was explained by female gender, physiological effects of use, sensation seeking, SPQ-B cognitive-perceptual and interpersonal factor scores, MHI-18 depression scores, external influences motives for use, frequency of alcohol use, the proportion of cannabis in typical joints/cones, and psychopathological subjective experiences of cannabis use. For EPM scores, a total of 36% of variance was explained by MHI-18 depression scores, SPQ-B

cognitive-perceptual factor scores, physiological effects of use, childhood/adolescent delinquent behaviour, external influences motives for use, number of proxy dependence criteria endorsed by participants, female gender, and frequency of alcohol use. These results indicate the importance of including psychopathology variables when assessing cognitive function. It is evident that positive psychotic symptomology (SPQ-B cognitive-perceptual factor) and current depression are key factors in predicting current levels of everyday cognitive function. Also evident is the importance of the role played by physiological effects of cannabis use (e.g., getting the 'munchies', having blood shot eyes, impaired coordination).

Physiological effects of cannabis use were investigated in Chapter 8, where 32% of variance in scores was explained by social/enhancement motives for use, younger age, normal and highest levels of intoxication, the number of proxy dependence criteria endorsed by participants, frequency of tobacco use, and external influences motives for use. Thus, physiological effects of cannabis use are related to high sessional doses of cannabis (levels of intoxication), and may therefore be indicative of a critical level of consumption. That is, individuals (e.g., young, dependent, tobacco smokers) who use enough cannabis to get highly intoxicated, and experience these physiological effects of use, may also be using enough cannabis to lead to impaired cognitive functioning. Hence, the physiological effects of acute use may be an indicator of the neuropsychological impact of cannabis use.

Conclusions

In summary, cannabis use factors explained modest amounts of variance in CFQ memory and distractibility factor scores, and EPM scores. Only one cannabis use factor was retained in the final regression model for each of the cognitive variables, and each explained a very small proportion of the variance. In contrast, psychopathology variables played an important role in explaining the variance in memory, distractibility and EPM scores, as did the physiological effects of cannabis intoxication. These results suggest that the differences in

cognitive functioning found by previous researchers may have been confounded by not taking psychopathology into account. Further, susceptibility to physiological acute effects of cannabis use, whether due to high levels of intoxication or some other mechanism, is linked to higher levels of impairment in everyday cognitive functioning. However, with between 58% and 71% of the variance in everyday cognitive functioning variable scores unexplained, there are clearly other important factors that were not assessed in the present study. For example, it is likely that at least some of this variance would be explained by the participants' innate levels of cognitive ability/intelligence (Pope et al., 2003).

It is important to note that the vast majority of participants were not classified as experiencing high levels of cognitive failures (86%). Yet, taking cognitive functioning into account increased the proportion of participants who were likely to be experiencing some level of impairment in everyday functioning from 29% to 35%. As has been previously discussed, although it is clear that cannabis use may exacerbate pre-existing conditions, most of the functional impairment experienced by the affected participants is unrelated to cannabis use factors after controlling for potential confounds. Rather, cognitive impairment was found to be primarily related to psychopathology, while psychopathology was primarily related to comorbidity of disorders and subjective experiences of use, and, in turn, subjective experiences of use were primarily associated with motives for cannabis use. Thus, the logical place to start with the development of a cannabis user typology appears to be with the participants' motives for cannabis use; this process is described in the next chapter.

Cognitive Functioning Variables

A number of variables were described in this Chapter. They are displayed in Table 10.6, while the descriptive statistics for these variables are provided in Appendix K24.

Table 10.6
Cognitive Functioning Variables

	Scoring Range	Score Interpretation
Cognitive Failures Questionnaire		
Total score (α=.93)	0 – 100	Higher score = more cognitive failures
Memory factor (α=.84)	0 – 32	Higher score = more memory errors
Distractibility factor (α=.83)	0 – 36	Higher score = more problems with distractibility
Blunders factor (α=.76)	0 – 28	Higher score = more blunders
Names factor (α=.78)	0 – 8	Higher score = more errors remembering names
Everyday and Prospective Memory		
Total score (α=.94)	0 – 60	Higher score = more everyday and prospective memory errors

CHAPTER 11
DEVELOPMENT OF A CANNABIS USER TYPOLOGY

Introduction

The fourth objective of this investigation is the development of a cannabis user typology. As noted in Chapter 1, cannabis user typologies aim to increase understanding of the complexities of cannabis use and explore possible differences between cannabis users. The present chapter covers the development and validation of a cannabis user typology, the cannabis user types are explored in relation to current and childhood lifestyles in Chapter 12, while the everyday functioning of the user types is investigated in Chapter 13.

Existing Cannabis User Typologies

The body of literature for cannabis use typologies consists of a number of different approached to identifying cannabis user types. These studies have been broadly classified as either cross-sectional or longitudinal approaches.

Cross-sectional Approaches

The UNODC (2006) typology identified four types of annual cannabis users: Casual, Regular, Daily, and Chronic. Casual Users, those who consume cannabis less than once a month, account for approximately 46% of annual cannabis users in the world. They are unlikely to ever smoke a full joint by themselves, usually preferring to share a joint with two to three other people, on average. The next largest group is Regular Users (41% of annual users), who are more likely to use cannabis alone, and, although not using on a daily basis, are likely to consume more than one joint on the days they do use. Approximately 9% of annual users were classified as Daily Users and 4% as Chronic Users (i.e., those who are continually intoxicated). Daily Users were defined as those who tend to smoke 1-4 joints

each day. Usage levels for the Chronic group were reported to vary widely, but 10 joints a day was deemed a 'reasonable level for fairly constant intoxication' (UNODC, 2006, p. 171).

The Canadian Senate Special Committee on Illegal Drugs (2002) typology also identified four different cannabis user types: Experimental/Occasional, Regular, At-Risk, and Excessive users. Experimental/Occasional Users were described as being motivated by curiosity, consuming variable quantities on only a few occasions in their lifetime. Regular Users primarily use cannabis recreationally and/or socially, typically using with other people in the evening. They tend to consume a few joints, a few times a month, for a number of years, and are unlikely to ever use intensively. Individuals deemed to be At-Risk Users are under 16 years of age and use cannabis both recreationally and occupationally (i.e., before work or school). They tend to use alone, consume an average of 0.1-1 gram of cannabis a day, using a few times a week, particularly in the evening or on the weekend. At-Risk Users tend to follow this pattern of use for a number of years, interspersed with periods of intensive use. The final user type, Excessive Users, tend to experience cannabis-related occupational and personal problems, and are described as not having the ability to self-regulate their use. They tend to use cannabis multiple times a day, consuming more than a gram of cannabis each day, with high intensity use engaged in for months at a time. This pattern of use is generally exhibited for several years (Senate Special Committee on Illegal Drugs, 2002).

Hammersley and Leon (2006) explored cannabis use patterns in 176 university students (57% male), who ranged in age from 17-45 years (M = 22, SD = 3.9). The basis of their typology was data relating to the context of use, and the frequency with which cannabis was bought and consumed by participants. The four resulting user types were: Ex-users (10.2%); Casual Users (39%), who did not buy cannabis often, but might use it if it is offered; Regular Users (36%), who bought cannabis often and used it daily or near daily; and, Controlled Users (15%), who bought cannabis frequently but did not use it on most days.

In contrast, Miller and Plant (2002) first classified 2,641 teenage participants as either light (92%) or heavy (18%) users, based on lifetime use. Focusing on the heavy user group, the authors performed a cluster analysis (CA) using data on factors such as: quality of relationships with parents and friends; self-esteem; life satisfaction; depression; and, delinquent and antisocial behaviour. This procedure led to the identification of three disparate types of users: Antisocial (25%), Unhappy (34%), and Ordinary (41%). Antisocial users were the most likely to be males, display delinquent and aggressive behaviour, find it easy to obtain money from their parents, and have a large number of good friends. Unhappy users were unlikely to receive warmth, caring or mental support from their parents, and reported poor parental relationships. These users scored higher than the other groups on measures of depressed mood, and lower on measures of life satisfaction and self esteem. They were also lacking in supportive friends. In contrast, Ordinary users had good relationships with parents and friends, and scored lowest on delinquent and aggressive behaviour. This group was primarily distinguished from the other groups by their belief in abiding by society's rules, and their conviction that life is both stable and predictable.

Miller and Plant (2002) found that these three cannabis user types differed in terms of current cannabis use, with significantly fewer of the Ordinary group (56%) using cannabis more than 6 times in the previous 30 days, than either the Antisocial users (75%) or Unhappy users (73%). Ordinary users were also less likely to be heavy users of tobacco, alcohol and/or other illicit substances, than the other two user types. Ordinary users were primarily characterised as outgoing individuals, using cannabis for fun, and unlikely to progress to harder drugs. In contrast, the Antisocial users more likely to exhibit rebellious and difficult behaviours, with cannabis use being one aspect of their rule breaking behaviour. The researchers considered it likely that individuals in this group would progress to further deviant behaviour in the future. The last group, Unhappy users, were deemed to be using cannabis to 'self-medicate' in relation to self-esteem, depression and relationship issues.

However, it was noted that cannabis use also probably acted to worsen these aspects of the individuals' lives, creating a 'vicious circle' (Miller & Plant, 2002, p. 241).

Korf, Benschop, and Wouters (2007) identified three cannabis user types after recruiting a sample of 388 users (79% male, mean age: 28.4 years, *SD* = 8.6) through Dutch cannabis coffee shops. Their CA was based on 26 variables, broadly classified as demographic data (e.g., age, gender), user characteristics (e.g., age at initiation, preferred potency), consumption characteristics (e.g., month dose, depth of inhalation), and environmental characteristics (e.g., place of consumption, using alone). The cannabis user types were labeled Strongest High, Consistent High and Steady Quality. The Strongest High user group (*N* = 140, 86% male) had the youngest mean age (22.7 years, *SD* = 3.7) and also initiated cannabis at the youngest age (*M* = 14.4 years, *SD* = 2.2). These individuals were typically daily users (*M* = 27.4 days/month, *SD* = 6.3), consumed 5.7 joints per day on average (*SD* = 4.3), and preferred to smoke high potency cannabis. Individuals identified as Consistent High users (*N* = 148, 66% male) had a mean age of 27.7 years (*SD* = 6.5) and initiated cannabis use at 16.8 years of age on average (*SD* = 3.8). These individuals were the least frequent users, consuming an average of 3.1 joints (*SD* = 1.7) on an average of 21.1 days per month (*SD* = 10.1), and they preferred to smoke cannabis with the lowest potency level. The third user type, Steady Quality (*N* = 100, 91% male) contained the oldest participants, with a mean age of 37.5 years (*SD* = 8.7). These cannabis users had also initiated cannabis use at an older age than the other two user types (*M* = 17.2 years, *SD* = 4.2). Steady Quality Users were also typically daily users (*M* = 26.6 days/month, *SD* = 6.6), and consumed an average of 5.1 joints per day (*SD* = 2.6), preferring moderate potency cannabis.

Other key user type differences identified by Korf et al. (2007) included that Strongest High users endorsed more dependence criteria than either of the other user types, with Consistent High users endorsing the fewest. Further, while the majority of participants used cannabis at home, the proportion of Steady Quality users (70%) using in this setting was

higher that that for Consistent High (66%) and Strongest High (52%) users. Additionally, Steady Quality users were more likely to primarily consume cannabis alone (72%) than either Consistent High (27%) or Strongest High (25%) users.

Korf et al. (2007) posited that these three user types may represent successive phases in the cannabis use careers of individuals – with users initially using high amounts of high potency cannabis, before progressing to a more moderate level of use, and later graduating to a steady, habitual level of use. However, the authors also noted that it was also possible that their Consistent High user group contained two subtypes of cannabis users: 1) early onset users who had progressed to moderate use; and 2) later onset users who had never used cannabis heavily.

Longitudinal Approaches

Kandel and Chen (2000) employed data from the *New York State Follow-Up Cohort* study, which followed 708 participants (51% male) from adolescence (grade 10 or 11) for 19 years (to 34-35 years of age). A CA was employed with three clustering variables: age at initiation of use; months of near daily use; and, use in the year prior to the final data collection point. This analysis identified four different cannabis user types: Early Onset – Heavy Use, Early Onset – Light Use, Mid Onset – Heavy Use, and Late Onset – Light Use. The Early-Heavy user group (N = 61, 75% male) had the youngest mean age at initiation of use (15.0 years, SD = 2.2), the longest duration of near daily cannabis use (M = 131.1 months, SD = 36.2), used most frequently, and 50% were cannabis users at 34-35 years of age. Individuals identified as Early-Light users (N = 250, 46% male) had a mean age of 15.1 years (SD = 1.4) when they initiated cannabis, had used cannabis near daily for an average of 27.8 months (SD = 19.2), and were all (100%) current users at 34-35 years of age. Mid-Heavy users (N = 134, 63% male) initiated cannabis used at 16.1 years of age (SD = 2.1) on average, had used cannabis near daily for an average of 41.8 months (SD = 25.9), and were also all current cannabis users. In contrast, Late-Light users (N = 263, 45% male) had the oldest

mean age at onset of use (*M* = 19.5 years, *SD* = 2.1), reported the shortest average duration of near daily use (*M* = 21.4 months, *SD* = 18.1), used with the lowest frequency, and less than 1% were current users of cannabis at 34-35 years of age.

During adolescence, Early-Heavy users engaged in the highest levels of delinquent behaviour, followed by Mid-Heavy users, while both Light use groups reported low levels of such behaviour. This same pattern was evident in relation to levels of risk-taking personality traits. However, the user groups were not found to differ with regard to the levels of depressive symptoms assessed during adolescence. Overall, Early-Heavy users reported the highest use of tobacco and other illicit drugs at 34-35 years of age, however, Mid-Heavy users were the biggest consumers of alcohol, while Late-Light users were the least likely of the groups to report high level alcohol or tobacco consumption, or any other illicit substance use. Further, Early-Heavy users reported experiencing more cannabis use-related problems by age 34-35 years than the three other user groups, however Mid-Heavy users also reported more problems than either Early-Light of Late-Light users.

Windle and Wiesner (2004) employed data from the *Lives Across Time: A Longitudinal Study of Adolescent and Adult Development* (LAT) study, which followed 1205 participants (52% female) from adolescence to adulthood (mean age at beginning of study = 15.5 years, *SD* = 0.66). Using semiparametric group-based mixed modeling on the participants' patterns of cannabis use during adolescence (between 15.5 and 17 years of age), five different cannabis use trajectory groups were determined: Abstainers, Experimental Users, Decreasers, Increasers, and High Chronics. The majority of participants (*N* = 998) were classified as Abstainers (had not used cannabis ever), while the next largest group (*N* = 102) was Experimental Users (rarely used cannabis). Increasers (*N* = 44) initially reported low level cannabis use, with subsequent increases in such use throughout the study timeframe. In contrast, Decreasers (*N* = 44) were high users at the beginning of the study, reporting

decreased levels of use over time, and High Chronics (*N* = 20) maintained high levels of cannabis use throughout the life of the study.

These five cannabis use trajectory groups were found to differ in relation to risk factors during adolescence, with the majority of these differences evident between the Abstainers and the other user types. Focusing on the differences between the user types consisting of cannabis users, High Chronics were found: to use more alcohol than Experimental Users; to have more drug-using friends than either Experimental Users or Increasers; and to be more likely to have engaged in delinquent activity than all of the other user types. Decreasers were also found to have engaged in more delinquent behaviour than Experimental Users. The four cannabis-using groups were not found to differ in relation to peer alcohol use, grade point average, depressive symptoms, or stressful life events. However, Abstainers were found to differ from the other user types by: consuming less alcohol; having fewer alcohol- and drug-using friends; engaging in less delinquent behaviour; and, having experienced fewer stressful life events. Additionally, Abstainers had a higher grade point average than all but the Increasers, and reported fewer depressive symptoms than Increasers. No group differences were evident in relation to perceived family support (Windle & Wiesner, 2004).

The five cannabis use trajectory groups were also compared in relation to risk behaviours in young adulthood (24 years of age), while controlling for their use of cannabis at that point in time. These analyses indicated that Abstainers: consumed less alcohol than Decreasers and High Chronics, consumed less cannabis than all other user types; had fewer cannabis-using friends than all but Decreasers, and fewer other illicit drug-using friends than Increasers and High Chronics; and had achieved a higher level of education than Decreasers and High Chronics. Additionally, High Chronics were found to consume more cannabis than the other user types, and have a lower level of educational attainment than Experimental

Users. However, no group differences were indicated in relation to: use of alcohol by friends; depressive symptoms; stressful life events; or family cohesion (Windle & Wiesner, 2004).

Data from the RAND Adolescent/Young Adult Panel Study, involving 5,833 participants (49% female; mean age at beginning of study = 13 years), was employed by Ellickson, Martino, and Collins (2004) to identify five cannabis use trajectory groups: Abstainers, Early High Users, Stable Light Users, Steady Increasers, and Occasional Light Users. These groups were determined through the application of latent growth mixture modeling on the participants' patterns of cannabis use between the ages of 13 and 23 years of age. The largest group was the Abstainers, with 2,348 participants (48% female) classified as such. Early High Users (*N* = 147, 41% female), as the label suggest, were high users at baseline, but their cannabis use subsequently decreased to more moderate levels. In contrast, Steady Increasers (*N* = 809, 32% female), reported low levels of use at baseline and consistently higher levels of use at each later measure point. Stable Light User (N = 555, 49% female) maintained a low level of cannabis use throughout the duration of the study, while Occasional Light Users (N = 1,674, 58% female) were non-users at baseline who subsequently used low levels of cannabis.

These cannabis use trajectory groups were found to differ in relation to a number of outcomes assessed at 29 years of age, however these analyses do not appear to have controlled for possible confound due to the participants use of cannabis between the ages of 23 and 29 years. Nevertheless, Ellickson et al.'s (2004) findings included that Abstainers reported a higher level of education, greater life satisfaction, better overall health, and less use of illicit drugs, than the other user types With regard to mental health, Abstainers did not differ from Early High Users or Stable Light Users, but reported less psychological distress than Occasional Light Users and Steady Increasers. Early High Users did not differ from the other cannabis-using groups in relation to psychological distress or life satisfaction, but were more likely to use illicit drugs than Occasional Light Users, and reported a lower level of

educational attainment than all other groups. Interestingly, Steady Increasers, Stable Light Users and Occasional Light Users were similar across many of the variables, including overall health, psychological distress, and life satisfaction. However, Steady Increasers were the most frequent users of cannabis at 29 years of age.

Summary

The eight different cannabis user typologies reviewed above illustrate a wide variety of approaches to identifying subtypes of cannabis users. While there is some overlap between these typologies, it is evident that the approach employed, and particularly the variables used to differentiate between groups, have a large impact on the nature of the user types identified (see Tables 11.1 & 11.2). It is also apparent that all of these existing typologies have initially differentiated the groups in relation to the frequency or intensity of cannabis use. As such, these typologies neglect the possibility that patterns of cannabis use (such as the frequency and intensity of use) are influenced by an individual's motives for use and/or the context in which they use cannabis.

As noted in Chapter 1, it is posited in the present study that it is the combination of motives and context (both physical and social) that will best determine patterns of cannabis use. That is, motive will usually lead an individual to seek an appropriate context for use, however the context itself sometimes leading to a motivation to use cannabis, and in both circumstances this interplay between motives and context will contribute to other aspects of use, such as dose consumed, methods of administration, and subjective experience of use. Findings presented in earlier chapters are supportive of such a relationship between motivations for cannabis use and patterns of use.

Table 11.1

Existing Cannabis User Typologies – Cross-sectional Approaches

	UNDOC (2006)	**Canadian Senate Committee (2002)**	**Hammersley & Leon (2006)**	**Miller & Plant (2002)**	**Korf et al. (2007)**
No use			Ex-Users		
Infrequent use	Casual User - share joints - use < monthly	Experimental/ Occasional User - used few times ever	Casual Users - don't buy - use if offered		
Regular non-daily use	Regular User - 1 joint/use - use < daily	Regular User - few joints/use - use few/month - social context	Controlled User - buy cannabis - don't use on most days	Ordinary User - use at least weekly, for fun - low delinquent/aggressive behaviour - good parental relationship & friendships	
		At-Risk User - < 16 years old - few days/week - uses alone		Unhappy User - use at least weekly, self-medicating - poor parental relationship - few friends	Consistent High - 3 joints/use on 21days/month - low potency - 28 yrs old, onset at 17 yrs - use socially
Daily or near daily use	Daily User - 1-4 joints/use - daily use	Excessive User - multiple use/day - use-related problems	Regular Users - buy cannabis - use daily or near daily	Antisocial User - use at least weekly - high delinquent/aggressive behaviour - many friends	Steady Quality - 5 joints/use on 27days/month - mod potency - 38 yrs old, onset at 17 yrs - use alone
	Chronic User - > 4 joints/use - daily use				Strongest High - 6 joints/use on 27days/month - high potency - 23 yrs old, onset at 14 yrs - use socially

Table 11.2

Existing Cannabis User Typologies – Longitudinal Approaches

	Kandel & Chen (2000)	**Windle & Wiesner (2004)**	**Ellickson et al. (2004)**
No use during measurement period		Abstainers - low alcohol use, delinquent behaviour, stressful life events and depressive symptoms	Abstainers - good overall health and mental health, high life satisfaction, low drug use
Low use at baseline	Early Onset – Light Use - onset at 15 years, 28 months daily use - low delinquent behaviour and risk taking traits during adolescence - 100% users at 34-35 yrs, low AOD use	Experimental Users - rarely used cannabis throughout study period - low alcohol use and delinquent behaviour,	Occasional Light Users - non-users at baseline, rarely used later - good overall health and life satisfaction, moderate mental health, low drug use
	Late Onset – Light Use - onset at 20 years, 21 months daily use - low delinquent behaviour and risk taking traits during adolescence - >1% users at 34-35 yrs, low AOD use		Stable Light Users - consistently low level of use - good overall health and mental health, moderate life satisfaction, high drug use
	Mid Onset – Heavy Users - onset at 16 years, 42 months daily use - moderate delinquent behaviour and risk taking traits during adolescence - 100% users at 34-35 yrs, high alcohol use	Increasers - steady increase in use over study period - moderate alcohol use and delinquent behaviour, high depressive symptoms	Steady Increasers - steady increase in use over study period - moderate overall health and life satisfaction, poor mental health, high drug use
High use at baseline	Early Onset – Heavy Use - onset at 15 years, 131 months daily use - high delinquent behaviour and risk taking traits during adolescence - 50% users at 34-35 yrs, high use-related problems, high AOD use	Decreasers - steady decrease in use over study period - high alcohol use, moderate delinquent behaviour and depressive symptoms	Early High Users - high use at baseline, decrease to moderate use over study period - poor overall health and mental health, low life satisfaction, high drug use
		High Chronic - consistently high level of use - high alcohol use, delinquent behaviour, stressful life events, moderate depression	

Further, the cannabis user typologies reviewed above have restricted their investigation of user type differences to a small number of other aspects or outcomes of use. It is posited here that a more comprehensive typology would prove beneficial in relation to gaining an understanding of cannabis users and their use of cannabis. Hence, the present investigation will not only investigate differences between the identified cannabis user types in relation to past and present patterns of cannabis, but also with regard to demographic data, current and childhood lifestyle factors, subjective experiences of use, and everyday psychological and cognitive functioning. A typology incorporating this level of detail will aid in the development of appropriately targeted and holistic preventative, early intervention, and treatment strategies and services for cannabis users.

Therefore, the first section of this chapter will describe the development of a new cannabis user typology, while the second section will validate these clusters through an investigation of the differing patterns of current cannabis use, and key aspects of such use, as well as an exploration of the subjective experiences of cannabis use encountered by each cannabis user type. This exploration of the cannabis user types is continued in Chapter 12, with an investigation of demographic factors and both current and childhood lifestyles, while their everyday functioning is investigated in Chapter 13. The final section of the present chapter provides a summary of all information presented here and a discussion of relevant issues.

Determining User Types

Analyses

A Cluster Analysis (CA) was undertaken on data from all participants reporting cannabis use in the previous 12 months (*N*=795). CA is a technique employed to identify homogenous subgroups within a given population. In doing this, the analysis acts to

minimize the within-group variation, while maximizing the between-group variances, on the variables under examination (Garson, 2008). Assumptions underlying CA include: that the sample is representative of the population; there is minimal multicollinearity between the variables; an absence of outliers, and a good N to k ratio (Friel, 2008). All of these assumptions were met.

The variables included in the CA undertaken in the present study were motivations for cannabis use (17 items) and context of use (6 items relating to who it was used with, 6 items relating to location of use). Motivations for cannabis use were to: socialize, relax, get out of it, relieve boredom, have fun, feel normal, celebrate, relieve pain, reduce feelings of depression and/or anxiety, avoid symptoms of withdrawal, make it easier to get to sleep, ease the comedown from other substances, friends were using, it was available, no alcohol available, pressure to use, and enjoyable to use. The contextual items included in the CA were: use with friends, relatives, boyfriend/girlfriend or partner/spouse, colleagues, strangers or alone, and use at home, friends' houses, work, parties, in public, or at pubs, clubs, cafes or restaurants. All variables were assessed on a 5-point scale, from 0 = 'never' to 4 = 'every time'.

Determining the Number of Clusters

Initially, a hierarchical agglomerative CA was performed using average linkage between-groups, with squared Euclidean distance as the similarity measure. The agglomeration schedule was examined for an inconsistent jump in the dissimilarity coefficients, indicating the appropriate number of clusters (Clatworthy, Buick, Hankins, Weinman, & Horne, 2005). There were two such jumps in the agglomeration schedule, the first pointing to three clusters, and the second, to five clusters (see Appendix L1).

An iterative partitioning clustering method was then performed, using K-means, with both the 3- and 5-cluster models. This was followed by Discriminant Function Analyses (DFA) to determine which number of clusters seemed most appropriate (Clatworthy et al.,

2005). In both models, there were significant differences between clusters for all variables used in the clustering procedure (see Appendices L2 & L3). Both models resulted in high levels of cases being correctly identified through the DFA: 93.6% for the 3 cluster model; 93.8% for the 5 cluster model (see Appendices L4 & L5). Therefore, the 5 cluster model was selected over the 3 cluster model.

Variables Differentiating the Clusters

The DFA for the 5 cluster model identified four functions, of which only two had eigenvalues greater than 1. However, all four functions had moderate to high canonical correlations and were found to account for a significant amount of the variance between clusters (see Table 11.3). The structure matrix was examined for key variables loading on each function (see Appendix L6). The key variables identified are listed in Table 11.4 with the cluster means and standard deviations, and the functions at group centroids.

Table 11.3

Summary of Canonical Discriminant Functions

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	2.678	50.7	50.7	.853
2	1.782	33.7	84.4	.800
3	.594	11.2	95.7	.611
4	.229	4.3	100.0	.432

Test of Functions	Wilks' Lambda	Chi-Square	*df*	*p*
1 through 4	.050	2284.792	116	<.001
2 through 4	.183	1292.448	84	<.001
3 through 4	.510	512.734	54	<.001
4	.813	157.292	26	<.001

Function 1, accounting for 51% of explained variance between clusters, encompassed the use of cannabis to create a change in psychological state (e.g., stimulation or escaping from reality). Function 2 relates to solitary use, possibly of a self-medicating nature, while Functions 3 and 4 relate to different aspects of social use. Function 3 covers cannabis use because friends are using it and it is available, but, loading negatively on this function were use to have fun and enjoying cannabis use. The final function, which accounted for only 4% of variance between clusters, covered social use: either to celebrate or in social situations.

Table 11.4

Key Variables Discriminating Clusters and Functions at Group Centriods

	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**Cluster 5**
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Function 1 Group Centroid	*- 2.033*	*2.565*	*- 1.302*	*0.059*	*0.446*
Relieve boredom	0.46 (0.75)	2.51 (1.12)	0.77 (0.94)	1.24 (1.23)	2.13 (1.09)
Get out of it	0.46 (0.90)	2.09 (1.28)	0.43 (0.77)	0.92 (1.12)	1.55 (1.32)
Function 2 Group Centroid	*- 0.635*	*0.211*	*2.040*	*- 2.483*	*0.516*
Use alone	1.76 (1.04)	2.41 (0.96)	2.65 (0.84)	0.66 (0.79)	2.47 (0.92)
Relieve pain	0.57 (0.79)	1.73 (1.28)	2.17 (1.26)	0.36 (0.74)	1.55 (1.21)
Help sleep	0.57 (0.82)	2.22 (1.23)	1.94 (1.18)	0.52 (0.76)	1.67 (1.12)
Function 3 Group Centroid	*0.049*	*0.595*	*0.776*	*0.323*	*- 1.266*
Because available	0.67 (0.99)	2.90 (1.03)	1.22 (1.31)	1.72 (1.32)	0.95 (1.01)
To have fun	1.69 (1.23)	2.80 (1.06)	0.97 (1.00)	2.73 (1.15)	2.73 (0.91)
Friends using	0.40 (0.77)	1.72 (1.23)	0.39 (0.78)	1.22 (1.31)	0.31 (0.66)
Function 4 Group Centroid	*0.622*	*0.361*	*- 0.486*	*- 0.686*	*- 0.135*
To celebrate	0.95 (0.96)	2.10 (1.01)	0.86 (0.88)	1.03 (1.12)	1.39 (1.02)

Social and Physical Contexts of Use

Clusters 3 and 5 were most likely to use cannabis alone, while using with friends was the second most frequent social context of cannabis use. In contrast, Clusters 1 and 2 were

most likely to use cannabis with friends, followed by using alone. Only Cluster 4 did not nominate using alone as being one of their three most common social contexts of use; they used primarily with friends, followed by their boy/girlfriend or partner/spouse (see Appendix L7). Interestingly, while Clusters 1 and 3 were least likely to use cannabis with strangers, the other Clusters used with strangers more often than with family members or relatives. With regards to the physical contexts of use, Clusters 1, 2, 3 and 5 were most likely to use cannabis at home, with use at a friend's place second. This order was reversed for the members of Cluster 4, who were more likely to use cannabis at a friend's home than their own. The participants' place of work or study was the least likely physical context of use for Clusters 1 and 4, while a pub, club, café or restaurant was the least likely location of use for Clusters 2, 3 and 5.

Motives for Use

The primary motive for cannabis use for all five Clusters was because they enjoyed it, while four of the Clusters reported using to relax as their secondary motive (see Appendix L7). In contrast, the second most frequent motive for Cluster 4 was using cannabis to have fun. Cluster 3 differed quite markedly from the other Clusters by frequently using cannabis to aid sleep and to relieve pain, depression and/or anxiety. Using for social reasons was quite frequent for both Clusters 1 and 4, while Clusters 2 and 5 were more likely to use cannabis to relieve boredom. Furthermore, Clusters 2 and 4 indicated a level of opportunistic use in being frequently motivated by the availability of cannabis. The least frequent motive for cannabis use for all five Clusters was feeling pressured to use. Also in the bottom five reasons for use for all Clusters was using because alcohol was unavailable, using to avoid withdrawal symptoms, and using to feel normal. Clusters 1 and 4 were unlikely to use cannabis to relieve anxiety and/or depression, while Clusters 2, 3 and 5 were not often motivated to use cannabis because their friends were using the substance.

Motives for Use Subscales

The five clusters were compared with regards to motives for use subscale scores by way of three one-way ANOVAs. Unsurprisingly, large effect sizes were indicated in relation to the cluster differences for all three subscales: self-medication, $F(4, 749) = 123.68$, $p < .001$, $\eta^2 = .399$; social/enhancement motives, $F(4, 731) = 142.30$, $p < .001$, $\eta^2 = .439$; and, external influences, $F(4, 734) = 163.33$, $p < .001$, $\eta^2 = .472$ (see Appendices L8 & L9).

Self-medication subscale. The self-medication subscale has a scoring range of 0-12. Post hoc Tukey's HSD analyses indicated that Cluster 1 ($M = 1.46$, $SD = 1.48$) and Cluster 4 ($M = 1.25$, $SD = 1.53$) scored significantly lower on the self-medication subscale than Cluster 2 ($M = 5.57$, $SD = 2.70$), Cluster 3 ($M = 5.39$, $SD = 2.54$) and Cluster 5 ($M = 4.57$, $SD = 2.56$). Additionally, members of Cluster 5 were significantly less likely than Cluster 2 members to use cannabis for self-medication purposes (see Appendix L10).

Social/enhancement subscale. The social/enhancement subscale has a scoring range of 0-28. The post hoc Tukey's analyses investigating group differences in social/enhancement motives indicated that Cluster 1 ($M = 9.71$, $SD = 3.63$) and Cluster 3 ($M = 9.57$, $SD = 3.38$) scored significantly lower than all other Clusters. Furthermore, Cluster 4 ($M = 14.11$, $SD = 4.12$) scored significantly lower than Clusters 2 and 5, while members of Cluster 5 ($M = 16.06$, $SD = 3.36$) were significantly less likely to use cannabis for social/enhancement motives than members of Cluster 2 ($M = 18.27$, $SD = 4.10$) (see Appendix L10).

External influences subscale. The external influences subscale has a scoring range of 0-28. Post hoc Tukey's HSD analyses indicated that Cluster 1 ($M = 1.59$, $SD = 2.03$) scored significantly lower than Cluster 2 ($M = 7.86$, $SD = 3.51$), Cluster 4 ($M = 3.92$, $SD = 2.86$) and Cluster 5 ($M = 2.64$, $SD = 2.29$), while Cluster 3 ($M = 2.26$, $SD = 2.22$) and Cluster 5 scored significantly lower than Clusters 2 and 4. Furthermore, members of Cluster 4 were significantly less likely to use cannabis due to external influences than members of Cluster 2 (see Appendix L10).

To allow direct comparison between the Clusters' motives for use subscale scores, the mean scores for each Cluster were converted into percentage scores (see Figure 11.1). Cluster 3 reported proportionally more frequent use for self-medication motives than for other reasons. Thus, members of this Cluster differed markedly to the members of the other four Clusters, who all reported proportionately more social/enhancement motives for cannabis use. It is also evident that Cluster 2 scored higher (sometimes substantially so) on all motives for use subscales than the other four Clusters.

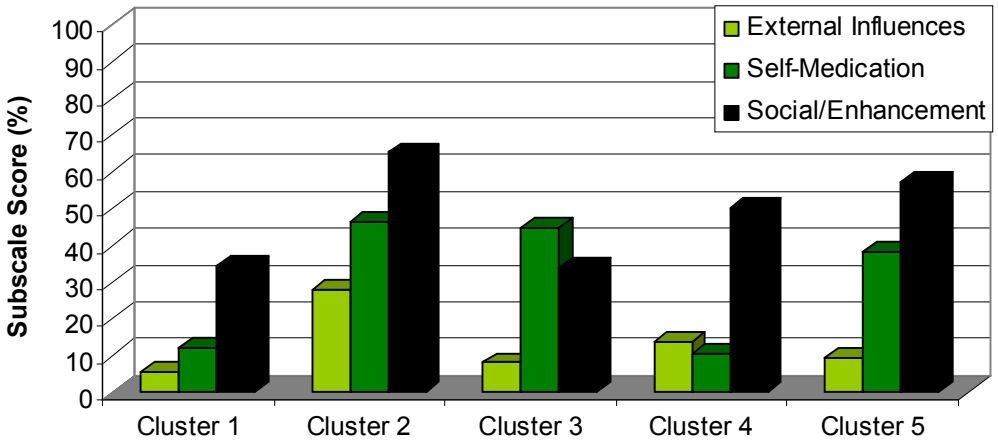

Figure 11.1. Motives for use subscale scores (expressed as percentages) by Cluster

Cluster Descriptions: Cannabis User Types

Cluster 1: Social Users

The 174 participants (22.3%) in this cluster were most likely to use cannabis with friends; but they sometimes used cannabis alone. They tended to use cannabis at home, at their friend's homes, or at parties, and were unlikely to use cannabis at their place of work or study, or with strangers. They were motivated to use cannabis for a number of social reasons; to have fun, celebrate, and socialise, with social/enhancement motives the most prominent

reason for use. They were the least likely to be motivated by external influences, and were unlikely to use cannabis to relieve anxiety and depression.

Cluster 2: Avid Users

The 167 participants (21.4%) who were members of Cluster 2 tended to rate all contexts and motives for use highly, indicating that they tended to use cannabis frequently, for a wide range of reasons, and in a variety of contexts. They were more likely to use with friends than alone, and were more likely to use with strangers than with members of their family, and were more likely to use in their own home than at a friend's home. They also tended to use cannabis at parties and were least likely to use in public venues such as pubs, clubs, cafés and restaurants. Avid Users were primarily motivated to use cannabis for social/enhancement reasons such as having fun and relieving boredom. They were also opportunistic in that they tended to use cannabis because it was available, but did not appear to be motivated to use cannabis just because their friends were using it. Interestingly, this Cluster also used cannabis frequently for self-medication purposes and because of external influences.

Cluster 3: Self-Medicators

There were 129 participants (16.5%) in Cluster 3. Their main reason for consuming cannabis was for pain relief, to aid with sleep, and to relieve depression and/or anxiety. Hence, their primary motivation for cannabis use was self-medication. In line with this, they were most likely to use cannabis alone and in their own homes. However, they did use cannabis with friends and their partner/spouse or boy/girlfriend, and sometimes used cannabis in their friend's homes, but they were not motivated to use just because their friends were using cannabis.

Cluster 4: Fun Seekers

The 116 participants (14.9%) in Cluster 4 were the least likely to use cannabis alone, primarily using cannabis with friends and at their friend's homes. Their main motivations for using cannabis included having fun and socialising, hence they were primarily motivated by social/enhancement motives, with the availability of cannabis leading to opportunistic use. The members of this Cluster were the least likely of the participants to be motivated to use cannabis for self-medication purposes, but were more likely to be motivated by external influences than Clusters 1, 3, and 5.

Cluster 5: State Changers

The 194 participants (24.9%) who were members of Cluster 5 were more likely to use cannabis alone than with friends. They used cannabis for both stimulation (to have fun and relieve boredom) and sedation (for relaxation and help with sleep). Thus, these participants used cannabis to change their psychological state at both ends of the activation continuum. Because of this dual usage, the members of this Cluster scored quite highly on both the social/enhancement motives and self-medication subscales. Further, while they did use cannabis with friends and at their homes, cannabis use by friends did not have much of an impact on their own motivation to use the substance.

Cannabis Use Factors

The user types were validated through comparison of cannabis use variables that were not involved in the clustering procedure. The 23 variables used for this purpose related to current patterns of cannabis use (14 variables), other key aspects of cannabis use (5 variables), and subjective experiences of use (4 variables). The means and standard deviations for all 23 variables are provided in Appendix L11. A series of one-way ANOVAs were

employed to determine group differences, with post hoc Tukey's HSD analyses completed for variables on which the user types differed significantly (see Appendices L12-L13).

Current Patterns of Cannabis Use

Rate of Use, Quantity & Quality

Frequency of use. Frequency of cannabis use was assessed for the 795 participants who had consumed cannabis in the previous 12 months and measured on a 5-point scale, from 1 = 'less than monthly use' to 5 = 'daily use'. The one-way ANOVA indicated a large between groups effect: $F(4, 778) = 46.02$, $p < .001$, $\eta^2 = .192$ (see Appendices L11 & L12). Post hoc Tukey's HSD analyses indicated that on average Avid Users, State Changers ($M = 4.02$, $SD = 1.12$) and Self-Medicators ($M = 4.04$, $SD = 1.14$) used cannabis on most days of the week, which was significantly more frequent use than for either Social Users ($M = 3.13$, $SD = 1.43$) or Fun Seekers ($M = 2.58$, $SD = 1.33$). On average, Social Users used cannabis weekly, which was significantly more frequent than the approximately fortnightly use engaged in by the Fun Seekers (see Figure 11.2 and Appendix L13).

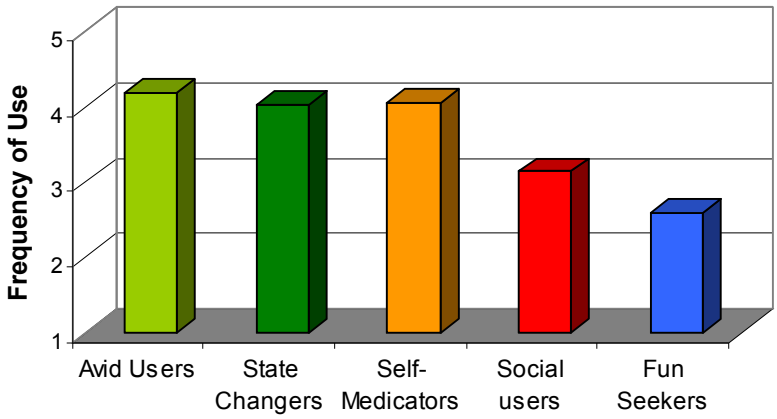

Figure 11.2. Frequency of cannabis use by cannabis user type

Number of cones/joints per week. The number of cones/joints consumed in a typical week was calculated for all participants reporting cannabis use in the previous 4 weeks and was scored from 1 = '1-2 cones/joints' to 11 = '150+ cones/joints'. However, for this analysis all participants who reported less than monthly cannabis use in the previous 12 months were assigned a score of 0. The one-way ANOVA indicated a large between groups effect: $F(4, 752) = 34.33, p < .001, \eta^2 = .155$ (see Appendices L11 & L12). Post Hoc Tukey's HSD analyses indicated that on average Avid Users (M =6.28, SD = 2.37), State Changers (M = 5.41, SD = 2.33) and Self-Medicators (M = 5.21, SD = 2.54) consumed significantly higher numbers of cones/joints in a typical than either Social Users (M = 3.95, SD = 2.65) or Fun Seekers (M = 3.23, SD = 2.43). Additionally, Avid users consumed significantly more cones/joints than State Changers and Self-Medicators (see Appendix L13). On average, Avid Users consumed approximately 23 joints/cones per week in comparison to the 17 consumed by State Changers and 16 by Self-Medicators, while Social Users consumed approximately 10 cones/joints per week and Fun Seekers consumed about 5 per week.

Cannabis type, preparation, & method of administration. The majority of participants in all five cannabis user groups had no primary type of cannabis; hence using both hydropoinc and bush cannabis interchangeably (see Table 11.5). However, it is interesting to note that the proportion of participants reporting no primary preference was substantially higher for the Fun Seekers and Social Users than for the other three user types. Similarly, while all cannabis user types were predominantly users of heads/buds, a substantially larger proportion of Fun Seekers than of the other cannabis user types primarily consumed cannabis leaf.

The primary method of administration used by the cannabis user types was more mixed. Joints were favoured by Social Users, Fun Seekers, and State Changers. Slightly more Self-Medicators primarily used pipes than joints, while about a third of the Avid Users used joints and an equal number reported having no primary method of cannabis administration.

Interestingly, the Social Users and Fun Seekers were more homogenous in relation to their primary method of administration than the other three cannabis user types (see Table 11.5).

Table 11.5

Cannabis Type, Preparation, and Method of Administration, by Cannabis User Type

	Social Users	**Avid Users**	**Self-Medicators**	**Fun Seekers**	**State Changers**
Type of Cannabis					
Hydroponic	24.7 %	31.1 %	31.0 %	21.6 %	36.3 %
Bush	9.2 %	16.8 %	14.0 %	6.9 %	9.8 %
No primary type	66.1 %	52.1 %	55.0 %	71.6 %	53.9 %
Cannabis Preparation					
Heads/buds	71.8 %	62.3 %	67.4 %	62.9 %	69.9 %
Leaf	1.7 %	1.2 %	3.1 %	12.9 %	3.1 %
Hashish	7.5 %	8.4 %	6.2 %	5.2 %	6.2 %
No primary preparation	19.0 %	28.1 %	23.3 %	19.0 %	20.7 %
Method of Administration					
Bong	14.9 %	11.4 %	19.4 %	13.8 %	19.7 %
Joint	40.2 %	32.9 %	31.0 %	45.7 %	33.7 %
Pipe	20.7 %	22.8 %	32.6 %	18.1 %	24.9 %
No primary method	24.1 %	32.9 %	17.1 %	22.4 %	21.8 %

Cannabis potency, proportion of cannabis, and strength of cones/joints. The one-way ANOVAs investigating the potency of cannabis and the proportion of cannabis included in the cones/joints consumed by the participants, and the resulting strength of their cones/joints, indicated that there were no significant group differences for any of these three variables (see Appendices L11 & L 12). However, State Changers had the highest potency scores and Fun Seekers the lowest, while the joints/cones consumed by Self-Medicators contained the highest proportion of cannabis (89%) and Fun Seekers used the smallest proportion of

cannabis in their cones/joints (82%). Overall, Self-Medicators consumed the strongest cones/joints, followed by State Changers, Social Users, Avid Users, with Fun Seekers consuming the weakest cones/joints.

Daily dose. Daily dose was calculated to account for both the quantity and quality of the cannabis consumed by participants, hence the number of cones/joints consumed by the strength of the cones/joints. All participants reporting cannabis use in the previous 4 weeks were assigned to one of 11 daily dose categories scored from 1 = a daily dose score of '< 5' to 11 = a daily dose score of '400+'. The one-way ANOVA indicated a large between groups effect: $F(4, 741) = 30.11$, $p<.001$, $\eta^2 = .140$ (see Appendices L11 & L12).

Post Hoc Tukey's HSD analyses indicated that on average Avid Users ($M = 5.78$, $SD = 2.41$), State Changers ($M = 5.08$, $SD = 2.48$), and Self-Medicators ($M = 5.00$, $SD = 2.51$) consumed significantly higher doses than those consumed by either Social Users ($M = 3.66$, $SD = 2.52$) or Fun Seekers ($M = 2.95$, $SD = 2.32$) (see Figure 11.3 and Appendix L13).

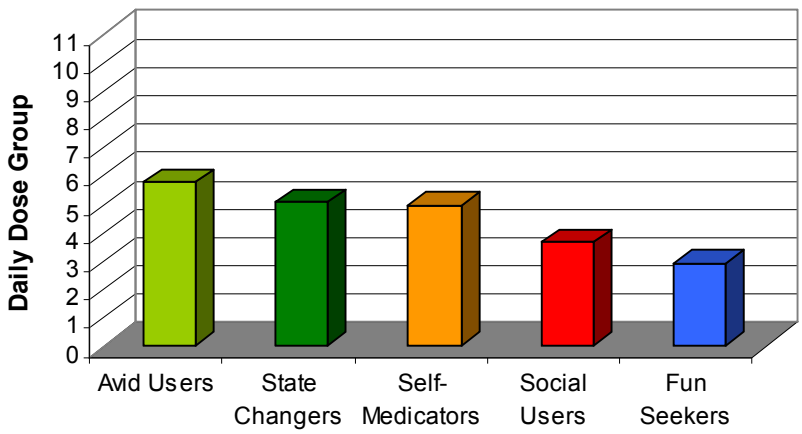

Figure 11.3. Daily dose by cannabis user type

Cannabis intoxication. All participants reporting cannabis use in the previous 12 months were asked to nominate both their normal and highest level of intoxication. Intoxication was

measured on a 6-point scale, from 0 = 'not intoxicated' to 5 = 'very high/stoned'. The one-way ANOVAs indicated a medium between groups effect for normal ($F[4, 773] = 15.63$, $p<.001$, $\eta^2 = .075$) and highest ($F[4, 774] = 9.81$, $p<.001$, $\eta^2 = .048$) levels of intoxication (see Appendices L11 & L12). Post Hoc Tukey's HSD analyses indicated that normal intoxication levels for Avid Users ($M = 2.80$, $SD = 1.12$) were significantly higher than those reported by Social Users ($M = 2.21$, $SD = 1.11$) and Self-Medicators ($M = 1.84$, $SD = 1.06$). Fun Seekers ($M = 2.57$, $SD = 1.06$) and State Changers ($M = 2.41$, $SD = 1.14$) also reported significantly higher normal levels of intoxication that that reported by Self-Medicators (see Appendix L13). With regards to highest levels of intoxication, Avid Users ($M = 4.28$, $SD = 0.91$) reported significantly higher levels than those reported by Fun Seekers ($M = 3.87$, $SD = 1.01$), Social Users ($M = 3.74$, $SD = 1.02$) and Self-Medicators ($M = 3.60$, $SD = 1.21$). State Changers ($M = 3.95$, $SD = 1.01$) did not differ significantly from any other cannabis user type (see Appendix L13).

Typically, the normal level of intoxication experienced by Self-Medicators was 'relaxed' to 'uninhibited', while the other user types were more likely to become 'uninhibited' or 'a little stoned/high'. However, the normal level of intoxication experienced by all user types was somewhat lower than the highest levels of intoxications they had reported. Thus, the highest intoxication level typically experienced by Avid Users was 'moderately' to 'very' high/stoned, while State Changers got 'moderately stoned/high', and Fun Seekers, Social Users and Self-Medicators tended to get 'a little' to 'moderately' stoned/high at their highest level of intoxication.

Concurrent Substance Use, Use-Related Problems & Recent Use

Concurrent use of tobacco, alcohol, and other substances. All participants reporting cannabis use in the previous 12 months were asked to nominate how frequently they used tobacco, alcohol and other substances concurrently with cannabis. This frequency of use was scored

on 3-point scale where 0 = 'never', 1 = 'sometimes' and 2 = 'mostly or always'. The one-way ANOVA investigating concurrent tobacco use indicated a small between groups effect: $F(4, 770) = 3.56$, $p = .007$, $\eta^2 = .018$, with Avid Users ($M = 1.13$, $SD = 0.85$) significantly more likely than Social Users ($M = 0.84$, $SD = 0.89$) to use tobacco at the same time as cannabis (see Figure 11.4 and Appendices L11-L13).

The one-way ANOVA investigating concurrent alcohol use indicated a medium between groups effect: $F(4, 771) = 12.33$, $p < .001$, $\eta^2 = .060$ (see Appendices L11 & L12). Post Hoc Tukey's HSD analyses indicated that Fun Seekers ($M = 1.19$, $SD = 0.63$) were significantly more likely to use alcohol concurrently than State Changers ($M = 0.90$, $SD = 0.55$), Social Users ($M = 0.90$, $SD = 0.62$) and Self-Medicators ($M = 0.68$, $SD = 0.60$). Avid Users ($M = 1.00$, $SD = 0.54$) were also significantly more likely to use alcohol at the same time as cannabis than Self-Medicators (see Figure 11.4 and Appendix L13).

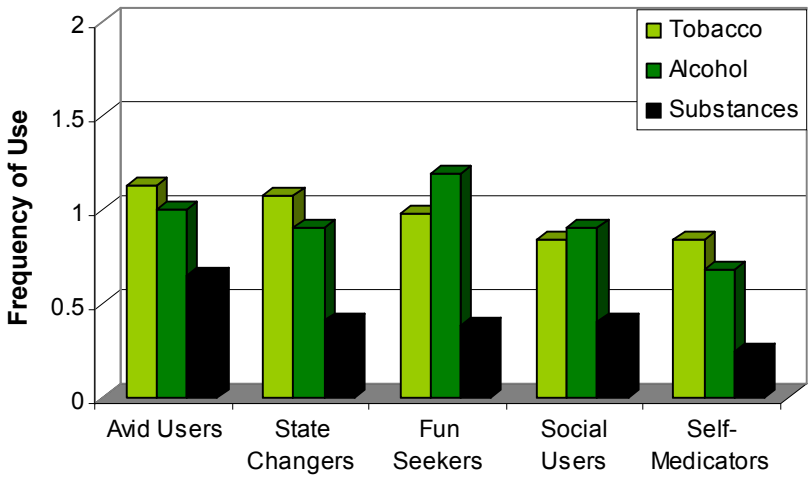

Figure 11.4. Frequency of concurrent tobacco, alcohol and substance use by cannabis user type

The one-way ANOVA investigating concurrent use of other substances indicated a medium between groups effect: $F(4, 774) = 10.67$, $p < .001$, $\eta^2 = .053$ (see Appendices L11 &

L12). Post Hoc Tukey's HSD analyses indicated that Avid Users (M = 0.65, SD = 0.62) were significantly more likely to engage in concurrent substance use than State Changers (M = 0.40, SD = 0.52), Social Users (M = 0.40, SD = 0.59), Fun Seekers (M = 0.38, SD = 0.56) and Self-Medicators (M = 0.25, SD = 0.45) (see Figure 11.5 and Appendix L13).

Problems associated with use. All participants reporting cannabis use in the previous 12 months were asked if they had experienced eight different cannabis use-related problems, thus the scoring range for this variable was 0-8. The one-way ANOVA indicated a medium between groups effect: $F(4, 775) = 12.65$, $p < .001$, $\eta^2 = .062$. Post hoc Tukey's HSD analyses indicated that Avid Users (M = 1.60, SD = 1.79) reported experiencing significantly more cannabis use-related problems than Self-Medicators (M = 0.89, SD = 1.13), Fun Seekers (M = 0.67, SD = 1.34), and Social Users (M = 0.66, SD = 1.29). State Changers (M = 1.34, SD = 1.65) also reported experiencing significantly more problems than Fun Seekers and Social Users (see Appendices L11-L13).

Recent use. All participants reporting cannabis use in the previous 4 weeks were asked how recently they had last used cannabis. Most recent use was scored on a 10-point scale, from 1 = 'in the previous four weeks' to 10 = 'in the previous hour'. However, for this analysis, all participants who had not used cannabis in the previous 4 weeks were assigned a score of 0. The one-way ANOVA indicated a large between groups effect: $F(4, 760) = 37.26$, $p < .001$, $\eta^2 = .165$ (see Appendices L11 & L13). Post hoc Tukey's HSD analyses indicated that Avid Users (M = 7.26, SD = 2.71), Self-Medicators (M = 6.70, SD = 3.04), and State Changers (M = 6.58, SD = 2.96) had all used cannabis significantly more recently than Social Users (M = 4.53, SD = 3.10) and Fun Seekers (M = 3.76, SD = 2.97) (see Appendix L13).

Avid Users had generally last consumed cannabis in the previous 5-7 hours, Self-Medicators and State Changers had used in the previous 8-24 hours, Social Users had last used cannabis in the previous 2-3 days, while Fun Seekers had used in the previous week.

Key Aspects of Cannabis Use

Age at Initiation of Use

While there were small differences between the cannabis user types with regards to average age at initiation of cannabis use, a one-way ANOVA indicated that these group differences were not significant (see Appendices L11 & L12). Overall, Avid Users were the youngest when they first tried cannabis, at 15.26 years (*SD* = 2.85), followed by State Changers (*M* = 15.58, *SD* = 3.21) and Fun Seekers (*M* = 15.91, *SD* = 2.45), while Social Users (*M* = 16.17, *SD* = 3.54) and Self-Medicators (*M* = 16.20, *SD* = 3.33) were typically slightly older.

Peak Use

The participants' peak level of cannabis use was measured on an 8-point scale, from 1 = 'never tried' to 8 = 'very heavy' use, however, as all of the participants included in the typology had used cannabis is the previous 12 months, the lowest peak use score for the user types was 2 = 'tried'. The one-way ANOVA indicated a large between groups effect: $F(4, 778)=37.06$, $p <.001$, $\eta^2 = .161$ (see Appendices L11 & L12). Post hoc Tukey's HSD analyses indicated that Fun Seekers (*M* = 4.59, *SD* = 1.48) reported a significantly lower level of peak use than all other cannabis user types. Additionally, the peak level of cannabis use for Social Users (*M* = 5.29, *SD* = 1.43) was significantly lower that that for Avid Users (*M* = 6.41, *SD* = 1.29), Self-Medicators (*M* = 6.02, *SD* = 1.32), and State Changers (*M* = 5.90, *SD* = 1.26) (see Figure 11.5 and Appendix L13).

Avid Users were typically moderate to heavy daily/near daily cannabis users at their peak level of use, Self-Medicators were moderate daily/near daily users, while State Changers and Social User peaked at light to moderate daily or near daily cannabis use. Thus, using the definitions provided to participants (see Chapter 7), Avid Users consumed approximately 7 cones/joints on all or most days of the week, Self-Medicators had about 4, while State

Changers consumed an average of 3 cones/joints, and Social Users had approximately 2 cones/joints on all of most days of the week In contrast, Fun Seekers were more likely to binge on cannabis, getting stoned/high up to three times a week.

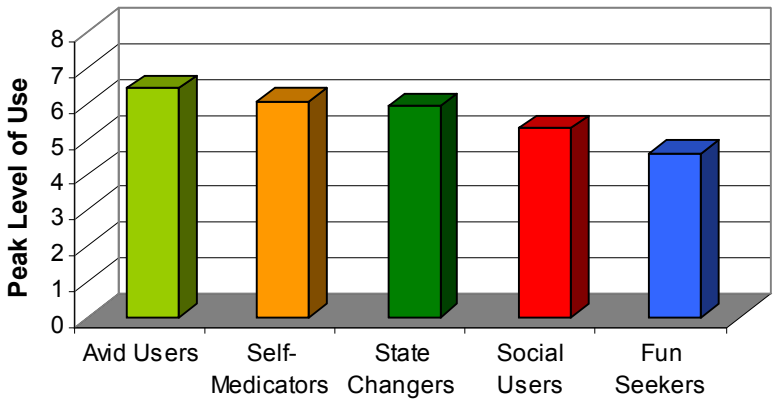

Figure 11.5. Peak use of cannabis by cannabis user type

Duration of Use

The participants' duration of cannabis use ranged from less than a year to 58 years. The one-way ANOVA indicated a large between groups effects: $F(4, 776) = 30.63$, $p < .001$ $\eta^2 = .137$ (see Appendices L11 & L12). Post hoc Tukey's HSD analyses indicated that Self-Medicators, with an average duration of 21.48 years ($SD = 12.58$), had used cannabis significantly longer than all other user types. Additionally, Fun Seekers ($M = 9.16$, $SD = 8.80$) and Avid Users ($M = 9.48$, $SD = 8.25$), had used cannabis for significantly shorter periods of time than both Social Users ($M = 15.91$, $SD = 12.12$) and State Changers ($M = 13.98$, $SD = 10.79$) (see Figure 11.6 and Appendix L13).

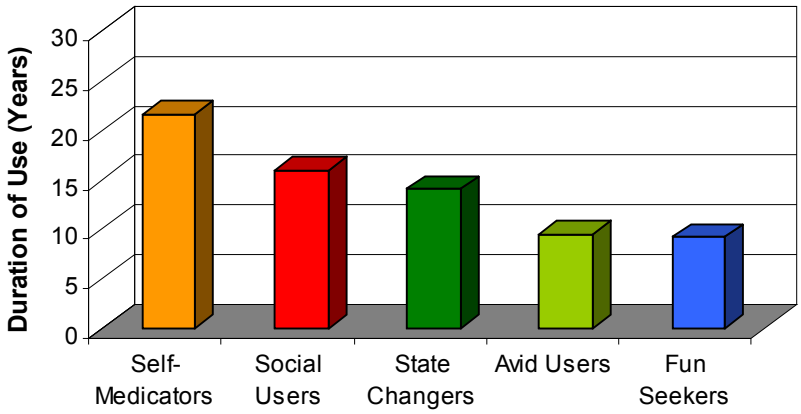

Figure 11.6. Duration of cannabis use by cannabis user type

Proxy Dependence & Number of Proxy Dependence Criteria

Proxy dependence. All participants who reported using cannabis daily in the previous week responded to seven items approximating the DSM-IV criteria for cannabis dependence. Those endorsing three or more of the proxy dependence items were classified as being dependent for the purposes of the present study. However, for this analysis, all participants who had not used cannabis daily in the previous week were assigned a score of 0 (1 = 'dependent', 0 = 'not dependent'). The one-way ANOVA indicated a moderate between groups effect: $F(4, 755) = 18.15$, $p < .001$, $\eta^2 = .088$ (see Appendices L11 & L12).

Post hoc Tukey's HSD analyses indicated that Avid Users ($M = 0.35$, $SD = 0.48$) were significantly more likely to meet proxy dependence criteria than all other user types. Furthermore, State Changers ($M = 0.19$, $SD = 0.40$) were significantly more likely than Social Users ($M = 0.06$, $SD = 0.24$) to meet proxy dependence criteria (see Appendix L13). Overall, 35.2% of Avid Users, 19.1% of State Changers, 10.9% of Self-Medicators, 6.4% of Fun Seekers, and 6.0% of Social Users, met proxy dependence criteria.

Number of Proxy Dependence Criteria. The number of proxy dependence criteria endorsed by participants was calculated for all those who had reported daily cannabis in the

previous week (scoring range: 0-7). However, for this analysis, all participants who had not used cannabis daily in the previous week were assigned a score of 0. The one-way ANOVA indicated a large between groups effect: $F(4, 755) = 28.33$, $p < .001$, $\eta^2 = .131$ (see Appendices L11 & L13). Post hoc Tukey's HSD analyses indicated that Avid Users (M = 1.88 SD = 1.89) and State Changers (M =1.27, SD = 1.60) endorsed a significantly higher number of the proxy dependence criteria than Social Users (M = 0.47, SD = 0.95) and Fun Seekers (M = 0.38, SD = 1.09). Avid Users also endorsed a significantly larger number of the proxy dependence criteria than Self-Medicators (M = 0.89, SD = 1.22) (see Figure 11.7 and Appendix L13).

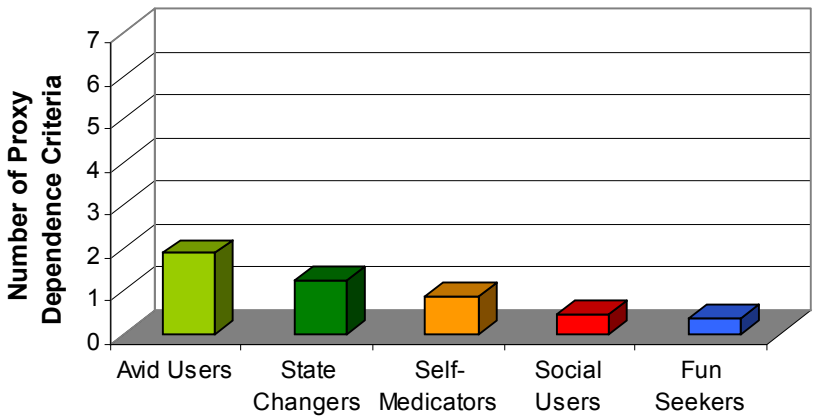

Figure 11.7. Number of proxy dependence criteria endorsed by cannabis user type

Subjective Experiences of Cannabis Use

Altered Reality Subscale

The altered reality subscale had a scoring range of 0-32. The one-way ANOVA indicated a large between groups effect: $F(4, 762) = 26.10$, $p < .001$, $\eta^2 = .121$ (see Appendices L11 & L12). Post Hoc Tukey's HSD analyses indicated that Avid Users (M =

14.25, *SD* = 6.02) were significantly more likely to report that altered perception of reality was a part of their cannabis-related experiences than State Changers (*M* = 11.53, *SD* = 5.06), Social Users (*M* = 9.79, *SD* = 5.89), and Self-Medicators (*M* = 7.94, *SD* = 5.14). Additionally, Fun Seekers (*M* = 11.94, *SD* = 6.09) and State Changers scored significantly higher on the altered reality subscale than Self-Medicators (see Appendix L13).

Psychopathological Experience Subscale

The psychopathological experience subscale had a scoring range of 0-16. The one-way ANOVA indicated a medium between groups effect: $F(4, 762) = 13.38$, $p < .001$, $\eta^2 = .066$ (see Appendices L11 & L12).Post Hoc Tukey's HSD analyses indicated that Avid Users (*M* = 3.10, *SD* = 2.96) were significantly more likely to report cannabis-related psychopathological experiences than any other cannabis user type (see Appendix L13). However, all user types were unlikely to report experiencing psychopathological outcomes in relation to their cannabis use.

Enhanced Experience Subscale

The enhanced experience subscale had a scoring range of 0-28. The one-way ANOVA indicated a large between groups effect: $F(4, 761) = 34.54$, $p < .001$, $\eta^2 = .154$ (see Appendices L11 & L12). Post Hoc Tukey's HSD analyses indicated that Avid Users (*M* = 16.26, *SD* = 4.92), Fun Seekers (*M* = 15.92, *SD* = 5.59), and State Changers (*M* = 14.19, *SD* = 4.98) reported significantly more frequent enhanced experiences of cannabis use than Social Users (*M* = 12.00, *SD* = 4.81) and Self-Medicators (*M* = 10.84, *SD* = 4.25) (see Appendix L13).

Physiological Effects Subscale

The physiological effects subscale had a scoring range of 0-28. The one-way ANOVA indicated a large between groups effect: $F(4, 762) = 36.70$, $p < .001$, $\eta^2 = .162$ (see Appendices L11 & L12). Post Hoc Tukey's HSD analyses indicated that Avid Users (*M* =

15.08, *SD* = 4.49) reported experiencing physiological effects of cannabis use significantly more frequently than all other cannabis user types. Additionally, State Changers (*M* = 12.88, *SD* = 4.61) and Fun Seekers (*M* = 12.86, *SD* = 4.21) scored significantly higher on this subscale than Self-Medicators (*M* = 10.53, *SD* = 4.01) and Social Users (*M* = 10.04, *SD* = 4.44) (see Appendix L13).

To allow direct comparison between the cannabis user types' subjective experience subscale scores, the mean scores for each user type were converted into percentage scores (see Figure 11.8). Through this procedure it became apparent that all clusters were most likely to encounter enhanced experiences (e.g., feeling happy or excited, laughing and talking more than normal) while using cannabis and few had psychopathological experiences (e.g., feeling depressed, anxious or paranoid).

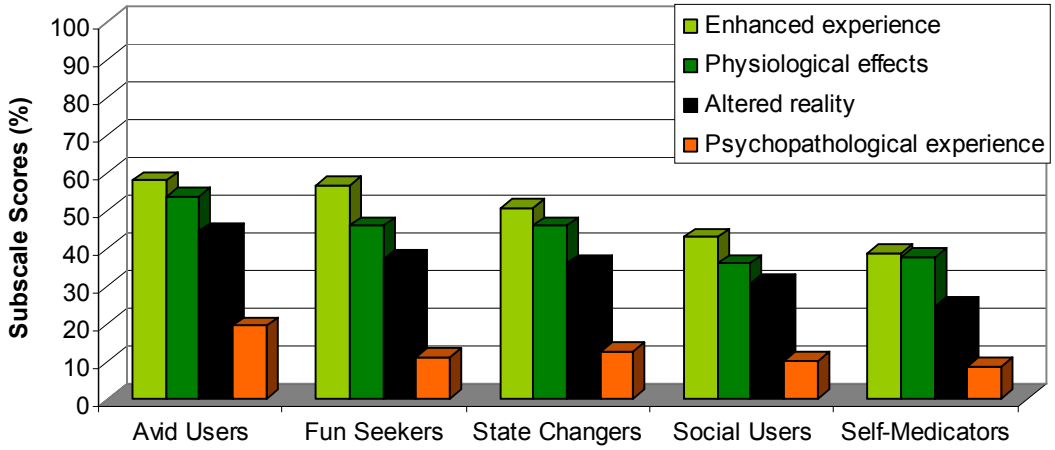

Figure 11.8. Subjective experiences of use subscale scores (expressed as percentages) by cannabis user type

Summary & Discussion

The Cannabis User Types

Five cannabis user types were identified with regard to motivations for using cannabis, and the context in which the substance was consumed. These user types were found to differ in terms of current patterns of cannabis use, key aspects of use, and the subjective effects experienced in relation to use.

Fun Seekers

Fun Seekers tended to use cannabis with friends and at their friend's homes. They were primarily motivated to use cannabis for social/enhancement purposes, with external influences also playing a role, and they were unlikely to use cannabis for self-medication purposes. Fun Seekers tended to use cannabis infrequently, typically on a fortnightly basis; they had generally last used cannabis in the week prior to participating in the present study. On average, they consumed about five joints per week, which tended to be low strength in comparison to those consumed by other cannabis user types. Overall, Fun Seekers consumed the lowest daily dose of all the cannabis user groups. Normally, Fun Seekers became uninhibited or a little stoned/high when they used cannabis, but varied from a little to moderately stoned/high at their highest levels of use. They were more likely than the other cannabis user groups to use alcohol concurrently with cannabis.

Fun Seekers were 15.9 years old on average when they first tried cannabis and had been using for approximately nine years. They tended not to have ever used on a daily or near daily basis, with binge use their average peak level of use. Fun Seekers reported the second lowest number of cannabis use-related problems, and endorsed fewer proxy dependence criteria than all other cannabis user types. In all, 6% of Fun Seekers met the criteria for proxy cannabis dependence.

Social Users

Social Users were most likely to use cannabis with friends in their own home. They were primarily motivated to use cannabis for social/enhancement purposes, and were unlikely to be motivated by external influences or self-medication purposes. Social Users tended to used cannabis on a weekly basis, consuming about 10 cones/joints per week; they had typically last used cannabis two to three days prior to participating in the present study. Social Users tended to consumed lower potency cannabis than other user groups, and moderate strength cones/joints, thus resulting in a lower daily cannabis dose than most of the cannabis user groups (Fun Seekers being the exception). Normally, Social Users became uninhibited or a little stoned/high when they used cannabis, and varied from a little to moderately stoned/high at their highest levels of use. Social Users consumed alcohol more frequently in conjunction with cannabis than either tobacco or other drugs.

Social Users were 16.2 years old on average when they first tried cannabis and had been using for approximately 16 years. Their peak level of cannabis use was light to moderate daily or near daily use; consuming approximately 2 cones/joints on all or most days of the week. Social Users reported less cannabis use-related problems than all other cannabis user types, and endorsed the second lowest number of proxy dependence criteria. In all, 6% of Social Users met the criteria for proxy cannabis dependence.

Avid Users

Avid Users tended to use cannabis with friends in their own home. They were primarily motivated to use cannabis for social/enhancement reasons; however they also used frequently for self-medication purposes and because of external influences. Avid Users tended to used cannabis on most days of the week, and had typically last used cannabis 5-7 hours prior to participating in the present study. On average, they consumed about 23 cones/joints per week, which tended to be of moderate strength in comparison to those

consumed by other cannabis user types. Overall, Avid Users consumed the highest daily dose of all the cannabis user groups. Normally, Avid Users became uninhibited or a little stoned/high when they used cannabis, but varied from moderately to highly stoned/high at their highest levels of use. Avid Users scored highest on all subjective experience subscales, indicating that they reported experiencing both negative and positive effects of use more frequently than the other user groups. They were the most frequent consumers of tobacco and other substances in conjunction with cannabis.

Avid Users were 15.3 years old on average when they first tried cannabis and had been using for approximately nine and a half years. Their peak level of cannabis use was moderate to heavy daily or near daily use; consuming approximately 7 cones/joints on all or most days of the week. Avid Users reported the highest number of cannabis use-related problems, and endorsed more proxy dependence criteria than all other cannabis user types. In all, 35% of Avid Users met the criteria for proxy cannabis dependence.

State Changers

State Changers were most likely to use cannabis alone in their own home. They were primarily motivated to use cannabis for social/enhancement reasons, but also used frequently for self-medication purposes. State Changers tended to used cannabis on most days of the week, and had typically last used cannabis 8-24 hours prior to participating in the present study. On average, they consumed about 17 cones/joints per week, which tended to be of fairly strong in comparison to those consumed by other cannabis user types. Overall, State Changers consumed the second highest daily dose of all the cannabis user groups. Normally, State Changers became uninhibited or a little stoned/high when they used cannabis and moderately stoned/high at their highest levels of use.

State Changers were 15.6 years old on average when they first tried cannabis and had been using for approximately 14 years. Their peak level of cannabis use was light to moderate daily or near daily use; consuming approximately 3 cones/joints on all or most days of the

week. State Changers reported the second highest number of cannabis use-related problems, and endorsed the second highest number of proxy dependence criteria in comparison to the other cannabis user types. In all, 19% of State Changers met the criteria for proxy cannabis dependence.

Self-Medicators

Self-Medicators were most likely to use cannabis alone in their own home, and were primarily motivated to use cannabis for self-medication purposes. Self-Medicators tended to used cannabis on most days of the week, and had typically last used cannabis 8-24 hours prior to participating in the present study. On average, they consumed about 16 cones/joints per week, which were stronger than those consumed by any of the other cannabis user types. However, overall, Self-Medicators were moderate users in relation to their daily cannabis dose, with higher doses than Social Users and Fun Seekers, and lower doses than Avid Users and State Changers. Normally, Self-Medicators became relaxed or uninhibited when they used cannabis, and became a little to moderately stoned/high at their highest levels of use. Self-Medicators scored lowest on all but one (physiological effects) of the subjective experience subscales, indicating that they tended to experience both negative and positive effects of use less frequently than the other user groups. Self-Medicators were also less likely to consumed alcohol and other substances concurrently with cannabis than the other user groups.

Self-Medicators were 16.2 years old on average when they first tried cannabis and had been using for approximately 21 years. Their peak level of cannabis use was moderate daily or near daily use; consuming approximately 4 cones/joints on all or most days of the week. As with daily dose, Self-Medicators fell in the middle of the user types with regards to both the number of cannabis use-related problems encountered and the number of proxy dependence criteria endorsed. In all, 11% of Self-Medicators met the criteria for proxy cannabis dependence.

Similarities & Differences

There are a number of similarities and differences evident for the cannabis user types. Social Users and Fun Seekers, who primarily used cannabis in social settings and for social/enhancement motives, were at the lower end of the range in relation to frequency of use, number of cones/joints consumed per week, daily dose, peak level of use, and number of cannabis use-related problems. They were also the least likely cannabis user types to meet proxy cannabis dependence criteria. While Avid Users also tended to use cannabis in social contexts and were similarly primarily motivated by social/enhancement motives, these participants were the most frequent cannabis users, used the highest number of cones/joints per week, had the highest daily dose, experienced higher levels of intoxication, and encountered the highest number of cannabis use-related problems. Avid Users were also the participants who were most likely to meet proxy dependence criteria.

State Changers were similar to Avid Users in many ways, tending to be second only to Avid Users in relation to most cannabis use variables, including proxy dependence. However, the State Changers did not tend to be social users, being more likely to use cannabis on their own. Self-Medicators were also most likely to use cannabis on their own, and, in contrast to all other user groups, were primarily motivated to use cannabis for self-medication purposes. This group tended to report moderate levels of use in relation to the cannabis use factors assessed here, but tended to experience the lowest levels of intoxication and subjective experiences.

Avid Users initiated cannabis use at the youngest age, while Self-Medicators were the oldest at the time they first tried cannabis. However, Self-Medicators had used cannabis for the longest duration, and Fun Seekers the shortest. These temporal variables are obviously linked to the participants' current age, which will be investigated in relation to the cannabis user types in Chapter 12.

Conclusions

These cannabis user types identified in this study do not fit neatly into any of the user categories from existing cannabis user typologies. Nevertheless, there are several similarities worth noting. With regards to the UNODC typology, Fun Seekers and Social Users are similar to Casual Users, State Changers and Self-Medicators are most similar to Regular or Daily users, and Avid Users could possibly be classified as either Daily or Chronic users. With respect to the Canadian Senate's typology, Fun Seekers could probably be classified as Regular users, and Avid Users as Excessive users. Additionally, Avid Users appear to be similar to Korf et al.'s (2007) Strongest High users, Social Users to Consistent High users, and State Changers appear to be similar to Steady Quality users.

It is apparent that both Fun Seekers and Social Users are less likely than the other cannabis user types to encounter cannabis use-related problems or endorse proxy dependence criteria. Therefore, it is proposed that Fun Seekers and Social Users are also unlikely to experience cannabis-related difficulties in other aspects of their everyday life. However, State Changers, Self-Medicators, and particularly Avid Users, may be using cannabis in a problematic manner, which may contribute to impairments in everyday functioning. This proposition will be explored further in relation to psychological wellbeing and cognitive functioning in Chapter 13. However, first, the cannabis user types will be investigated in relation to lifestyle factors in Chapter 12.

CHAPTER 12
CANNABIS USER TYPES

Introduction

The fourth objective of this investigation is the development of a cannabis user typology. In the previous chapter, five cannabis user types were identified in relation motives and contexts of cannabis use, and validated with regard to their current patterns of cannabis use, key aspects of such use, and their subjective experiences of cannabis use. This investigation of the cannabis user types is continued in present chapter, with a focus on current and childhood lifestyle factors.

In Chapter 11 it was apparent that there were large differences between the user types with regard to their current and past cannabis use. In previous chapters current and childhood lifestyle factors have been found to be associated with key cannabis use factors (in Chapters 5 and 7) and motives for cannabis use (in Chapter 8). Therefore, it is hypothesised that the cannabis user types will also differ in relation to the current and childhood lifestyles.

The first section of this Chapter investigates the demographic status and current lifestyles of the cannabis user types, while the second section explores the childhood lifestyles of the user types. The final section of the present chapter provides a summary of all information presented here and a discussion of relevant issues.

Current Lifestyle Factors

Demographic & Environmental Factors

Age & Gender

Fun Seekers contained the highest proportion of female participants (40% female), followed by Self-Medicators (36%), Avid Users (34%), and Social Users (29%), while State

Changers had the lowest proportion of female participants, at 28% (see Appendix M1). However, a one-way ANOVA (with: 'female' = 1; 'male' = 2) indicated that there were no significant gender effects: $F(4, 778) = 1.77$, $p = .133$, $\eta^2 = .009$ (see Appendices M2 & M3).

Avid Users and Fun Seekers were the youngest groups at 25 years of age on average ($M = 24.69$, $SD = 8.86$; $M = 24.99$, $SD = 9.67$, respectively). State Changers ($M = 29.63$, $SD = 10.98$) and Social Users ($M = 31.80$, $SD = 12.50$) were approximately 5-7 years older on average. As can be seen in Figure 12.1, Self-Medicators, at 38 years of age on average, were the oldest group ($M = 37.62$, $SD = 12.30$).

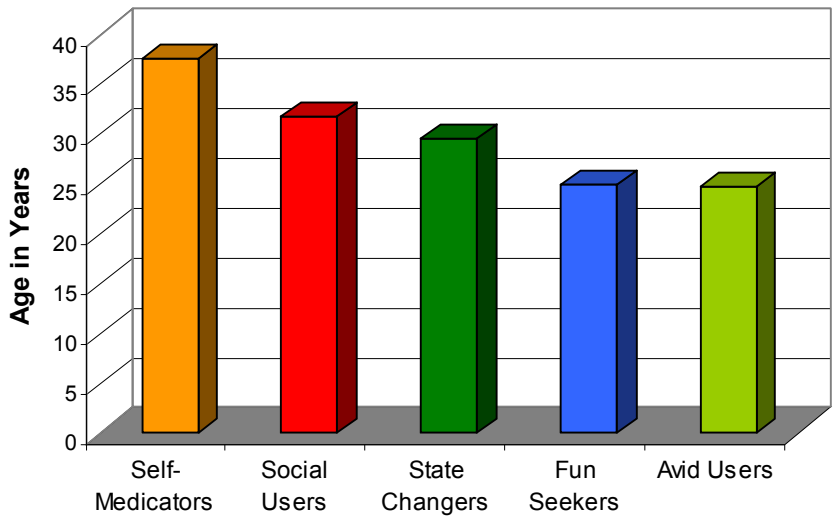

Figure 12.1. Age of participants by cannabis user type

A one-way ANOVA was undertaken to investigate age differences between the cannabis user types. This analysis indicated a large between groups effect: $F(4, 778) = 35.64$, $p < .001$, $\eta^2 = .156$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Avid Users and Fun Seekers were significantly younger than the other three cannabis user types. Additionally, Self-Medicators were found to be significantly older than State Changers and Social Users (see Figure 12.1 and Appendix M4).

Marital Status

Unsurprisingly, this variable appears to be associated with the participants' age; with the younger user groups being less likely than the older user types to be partnered (married or living with a partner). Thus, Self-Medicators were the cannabis user type with the highest proportion of partnered participants (56%), followed by Social Users (44%) and State Changers (41%), while the two youngest groups, Fun Seekers and Avid Users, had the lowest proportion of partnered participants (31% and 32%, respectively).

To investigate differences in marital status, participants were assigned a score of 1 if they were single and 0 if they were partnered. A one-way ANOVA indicated a small between groups effect: $F(4, 778) = 5.67$, $p < .001$, $\eta^2 = .028$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Self-Medicators ($M = 0.44$, $SD = 0.50$) were significantly more likely to be partnered than both Avid Users ($M = 0.68$, $SD = 0.47$) and Fun Seekers ($M = 0.69$, $SD = 0.46$) (see Appendix M4).

Highest Level of Education

Social Users were the cannabis user type with the highest proportion of tertiary educated participants (39%), while Avid Users had the lowest proportion (12%). Although this variable is linked to the participants' age (i.e., older participants have had more years in which to increase their level of education) it is clear that differences in level of educational attainment are not solely age-based. For example, Fun Seekers are approximately the same age as Avid Users, yet 26% of Fun Seekers have completed a university degree. Similarly, State Changers are only slightly younger on average than Social Users, yet only 27% of the former group has completed tertiary education. Furthermore, while Self-Medicators are the oldest group on average, they were the most likely to have not completed high school (see Table 12.1).

Table 12.1

Education by Cannabis User Type

	< High School		**High School**		**Post School Qualifications**		**University Degree**	
	N	%	*N*	%	*N*	%	*N*	%
Social Users (*N* = 174)	10	5.7 %	23	13.2 %	73	42.0 %	68	39.0 %
Avid Users (*N* = 167)	17	10.2 %	45	26.9 %	85	50.9 %	20	12.0 %
Self-Medicators (*N* = 129)	14	10.9 %	11	8.5 %	57	44.2 %	47	36.4 %
Fun Seekers (*N* = 116)	5	4.3 %	34	29.3 %	47	40.5 %	30	25.8 %
State Changers (*N* = 193)	19	9.8 %	42	21.8 %	81	42.0 %	51	26.5 %

The participants' highest level of education was scored on a 5-point scale, from 1 = 'less than high school' to 5 = 'postgraduate qualifications'. A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 9.10$, $p < .001$, $\eta^2 = .045$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Social Users ($M = 3.32$, $SD = 1.09$) had attained a significantly higher level of education than both Avid Users ($M = 2.68$, $SD = 0.89$) and State Changers ($M = 2.95$, $SD = 1.09$). Additionally, Self-Medicators ($M = 3.19$, $SD = 1.1$) were found have completed significantly more education than Avid Users (see Appendix M4).

Employment

Most Social Users, Self-Medicators, and State Changers were employed, while the majority of Fun Seekers were students. Avid Users were the least uniform group in terms of employment, with 38% studying, 44% employed, and 19% unemployed. Self-Medicators were the least likely to be students, probably because they were the oldest group, but they were more likely to be unemployed than the other groups (see Table 12.2).

Table 12.2

Employment by Cannabis User Type

	Student		**Employed**		**Unemployed**	
	N	%	*N*	%	*N*	%
Social Users (*N* = 174)	49	28.2 %	104	59.8 %	21	12.1 %
Avid Users (*N* = 167)	63	37.7 %	73	43.7 %	31	18.6 %
Self-Medicators (*N* = 129)	19	14.7 %	76	58.9 %	34	26.4 %
Fun Seekers (*N* = 116)	64	55.2 %	40	34.5 %	12	10.3 %
State Changers (*N* = 193)	55	22.0 %	113	58.5 %	25	13.0 %

To investigate differences in employment, participants were assigned a score of 1 if they were unemployed and 0 if they were employed or a student. A one-way ANOVA indicated a small between groups effect: $F(4, 778) = 4.41$, $p = .002$, $\eta^2 = .022$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Self-Medicators ($M = 0.26$, $SD = 0.44$) were significantly more likely to be unemployed than both Social Users ($M = 0.12$, $SD = 0.33$) and Fun Seekers ($M = 0.10$, $SD = 0.31$) (see Appendix M4).

Proxy SES

The participants' proxy socioeconomic status was scored on a 5-point scale (1-5) where higher scores were indicative of higher proxy SES. A one-way ANOVA indicated a small between groups effect for this variable: $F(4, 778) = 5.18$, $p < .001$, $\eta^2 = .026$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Avid Users ($M = 2.07$, $SD = 1.25$) had significantly lower proxy SES scores than Social Users ($M = 2.72$, $SD = 1.51$) (see Appendix M4).

Region of Residence

The most common regions of residence for all user types were suburban areas or large country towns, with the majority of Avid Users, Self-Medicators, and State Changers living in these areas. Social Users and Fun Seekers were more likely to be urban dwellers, while Self-Medicators were the least likely to live in urban areas, and Avid Users were the least likely to live in rural or remote regions (see Table 12.3).

Table 12.3

Region of Residence by Cannabis User Type

	Urban		**Suburban/Town**		**Rural/Remote**	
	N	%	*N*	%	*N*	%
Social Users (*N* = 174)	58	33.3 %	73	42.0 %	43	24.7 %
Avid Users (*N* = 167)	51	30.5 %	89	53.3 %	27	16.2 %
Self-Medicators (*N* = 129)	27	20.9 %	73	56.6 %	29	22.5 %
Fun Seekers (*N* = 116)	40	34.5 %	51	44.0 %	25	21.6 %
State Changers (*N* = 193)	52	26.9 %	102	52.8 %	39	20.2 %

Region of residence was scored on a 3-point scale, where 1 = 'urban', 2 = 'suburban/country town', and 3 = 'rural/remote. A one-way ANOVA indicated that there were no significant differences between the cannabis user types for this variable: $F(4, 778) = 1.09$, $p = .359$, $\eta^2 = .006$ (see Appendices M2 & M3).

Peer Cannabis Use

Avid Users were the most likely cannabis user type to report that all of their friends were cannabis users, while Self-Medicators were the least likely to report this (see Table 12.4). Similarly, Self-Medicators were the most likely to report that none of their friends used cannabis, and Avid Users the least likely. However, for the most common response for Avid Users, Fun Seekers, Social Users, and State Changers, was that most of their friends used

cannabis, while Self-Medicators were more likely to report that a few of their friends were cannabis users.

Table 12.4

Peer Cannabis Use by Cannabis User Type

	Number of Cannabis-Using Friends				
	None	Few	Many	Most	All
Social Users (*N* = 174)	2.9 %	33.3 %	21.8 %	39.1 %	2.9 %
Avid Users (*N* = 167)	0.0 %	21.0 %	18.0 %	44.3 %	16.8 %
Self-Medicators (*N* = 129)	3.1 %	40.3 %	26.4 %	28.7 %	1.6 %
Fun Seekers (*N* = 116)	0.9 %	36.2 %	15.5 %	42.2 %	5.2 %
State Changers (*N* = 193)	2.6 %	25.9 %	25.4 %	36.3 %	9.8 %

Peer cannabis use was scored on a 5-point scale, from 0 = 'none' to 4 = 'all' of their friends used cannabis. A one-way ANOVA indicated a medium between groups effect for this variable: $F(4, 778) = 10.80$, $p < .001$, $\eta^2 = .053$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Avid Users ($M = 2.57$, $SD = 1.00$) had a significantly higher proportion of cannabis using friends than Self-Medicators ($M = 1.85$, $SD = 0.93$), Social Users ($M = 2.06$, $SD = 0.98$), and Fun Seekers ($M = 2.15$, $SD = 1.01$). Additionally, State Changers ($M = 2.25$, $SD = 1.03$) had significantly more cannabis using friends than Self-Medicators (see Appendix M4).

Individual Factors

Use of Other Substances

Tobacco use. As can be seen in Table 12.5, almost half of Avid Users and State Changers were daily tobacco users, approximately a third of Social Users and Fun Seekers

used tobacco on a daily basis, while Self-Medicators were the most likely to be non-smokers. However, it is apparent that there were substantial proportions of each user group engaging in occasional tobacco use in the previous year.

Table 12.5

Frequency of Tobacco Use in previous 12 Months by Cannabis User Type

	Frequency of Use					
	No use	< Monthly	Monthly	Weekly	Most Days	Daily
Social Users (*N* = 174)	35.1 %	10.3 %	5.2 %	9.2 %	5.7 %	34.5 %
Avid Users (*N* = 167)	22.2 %	5.4 %	6.6 %	7.8 %	10.2 %	47.9 %
Self-Medicators (*N* = 129)	38.8 %	10.1 %	3.9 %	2.3 %	8.5 %	34.6 %
Fun Seekers (*N* = 116)	25.0 %	14.7 %	7.8 %	8.6 %	14.7 %	29.3 %
State Changers (*N* = 193)	26.9 %	8.3 %	3.6 %	6.7 %	7.8 %	46.6 %

The participants' frequency of tobacco use in the last 12 months was measured on a 6-point scale, from 1 = 'no use' to 6 = 'daily' consumption. A one-way ANOVA indicated a small between groups effect: $F(4, 778) = 4.49$, $p = .001$, $\eta^2 = .023$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Avid Users ($M = 4.22$, $SD = 2.07$) used tobacco significantly more frequently than Social Users ($M = 3.44$, $SD = 2.18$) (see Figure 12.2 and Appendix M4).

Alcohol use. Very few of the participants used alcohol on a daily basis in the previous 12 months, with State Changers were the most likely to do so, and Fun Seekers the least likely (see Table 12.6). However, Fun Seekers were also the least likely of the cannabis user types to have not used alcohol in the previous 12 month. The most common frequency of use for Avid Users, State Changers, Social Users, and Fun Seekers, was weekly consumption of alcohol, while Self-Medicators were most likely to report use on a less than monthly basis.

Table 12.6

Frequency of Alcohol Use in previous 12 Months by Cannabis User Type

	Frequency of Use					
	No use	< Monthly	Monthly	Weekly	Most Days	Daily
Social Users (*N* = 174)	12.1 %	17.8 %	24.7 %	29.9 %	13.2 %	2.3 %
Avid Users (*N* = 167)	11.4 %	19.8 %	18.6 %	40.1 %	9.0 %	1.2 %
Self-Medicators (*N* = 129)	24.0 %	27.1 %	17.8 %	22.5 %	7.0 %	1.6 %
Fun Seekers (*N* = 116)	4.3 %	12.9 %	18.1 %	50.9 %	12.9 %	0.9 %
State Changers (*N* = 193)	11.9 %	21.2 %	22.3 %	33.7 %	7.3 %	3.6 %

The participants' frequency of alcohol consumption in the past 12 months was measured on a 6-point scale, from 1 = 'no use' to 6 = 'daily' consumption. A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 8.60$, $p < .001$, $\eta^2 = .043$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Self-Medicators ($M = 2.66$, $SD = 1.33$) consumed alcohol significantly less frequently than all of the other cannabis user types. Interestingly, Fun Seekers ($M = 3.58$, $SD = 1.04$) were the most frequent users of alcohol (see Figure 12.2 and Appendix M4).

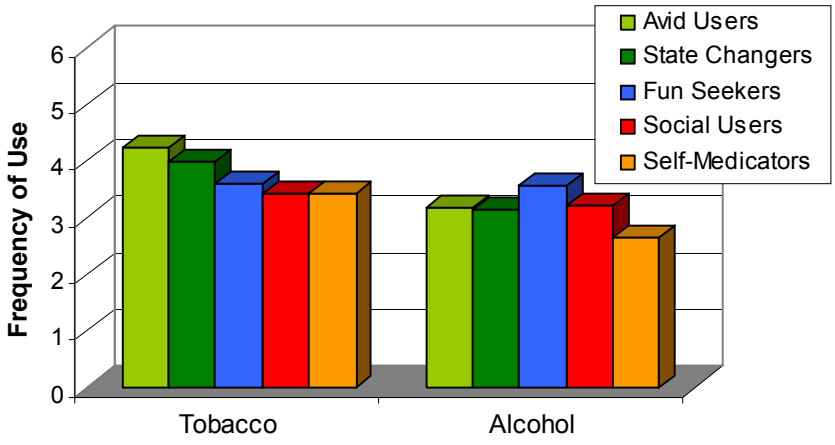

Figure 12.2. Frequency of tobacco and alcohol use by cannabis user type

Poly-substance use. The majority of Fun Seekers, Social Users, and State Changers did not use any illicit substances besides cannabis in the month prior to participating in the present study (see Table 12.7). It was also most common for Self-Medicators and Avid Users to have not used other illicit substances in the previous month. However, substantial proportions of each cannabis user type had engaged in extensive poly-substance use in the past month, with 30% of Self-Medicators, 27% of Avid Users, 26% of State Changers, 26% of Social Users, and 18% of Fun Seekers, consuming three or more illicit substances (excluding cannabis) in the previous month.

Table 12.7

Poly-Substance Use in previous Month by Cannabis User Type

	Number of Substances				
	None	1 - 2	3 - 4	5 - 8	9+
Social Users (*N* = 174)	51.7 %	22.4 %	13.2 %	8.6 %	4.0 %
Avid Users (*N* = 167)	42.5 %	30.5 %	15.0 %	8.4 %	3.6 %
Self-Medicators (*N* = 129)	45.0 %	25.6 %	16.3 %	9.3 %	3.9 %
Fun Seekers (*N* = 116)	58.6 %	23.3 %	11.2 %	3.4 %	3.4 %
State Changers (*N* = 193)	50.4 %	23.6 %	13.9 %	8.5 %	3.6 %

The number of illicit substances (excluding cannabis) that the participants had used in the previous month was scored on a 5-point scale, from 0 = 'no substances' to 4 = '9 or more substances'. A one-way ANOVA indicated a that the cannabis user types did not differ significantly on this variable: $F(4, 778) = 1.55$, $p = .186$, $\eta^2 = .008$ (see Appendices M2 & M3).

Sensation Seeking

Sensation seeking traits were assessed by way of a 6-item combined sensation seeking scale (see Chapter 4) with a scoring range of 0-30. A one-way ANOVA indicated a moderate

between groups effect for this variable: $F(4, 778) = 12.30$, $p < .001$, $\eta^2 = .060$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Self-Medicators ($M = 16.40$, $SD = 4.78$) had a significantly lower sensation seeking scores than Avid Users ($M = 19.77$, $SD = 4.92$), Fun Seekers ($M = 19.21$, $SD = 4.28$), and State Changers ($M = 18.67$, $SD = 4.65$). Social Users ($M = 17.63$, $SD = 4.92$) also had significantly lower scores than Avid Users (see Appendix M4).

Health and Sleep Problems

Health problems. Health problems were scored on a 5-point scale, from 0 = 'no health issues' to 4 = 'high level of health issues'. A one-way ANOVA indicated a moderate between groups effect for this variable: $F(4, 778) = 9.38$, $p < .001$, $\eta^2 = .046$ (see Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated that on average Self-Medicators ($M = 1.30$, $SD = 1.40$) had a reported experiencing significantly higher levels of health issues than all other cannabis users types (see Figure 12.3 and Appendix M4).

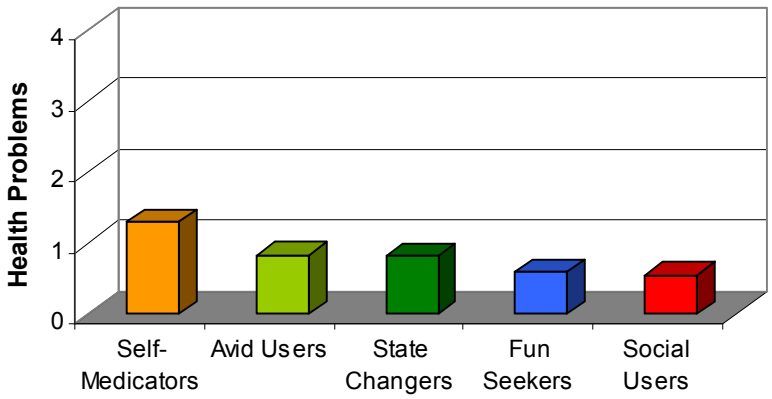

Figure 12.3. Health problems by cannabis user type

Sleep problems. Sleep problems were scored on a 4-point scale, from 0 = 'no sleep problems' to 3 = 'always affected by sleep problems'. A one-way ANOVA indicated a moderate between groups effect for this variable: $F(4, 778) = 7.30$, $p < .001$, $\eta^2 = .036$ (see

Appendices M2 & M3). Post hoc Tukey's HSD analyses indicated both State Changers (*M* = 0.94, *SD* = 1.04) and Self-Medicators (*M* = 0.86, *SD* = 0.96) reported more frequent sleep problems than Social Users (*M* = 0.49, *SD* = 0.77). Additionally, Fun Seekers (*M* = 0.53, *SD* = 0.90) reported experiencing significantly less frequent sleep problems than State Changers (see Figure 12.4 and Appendix M4).

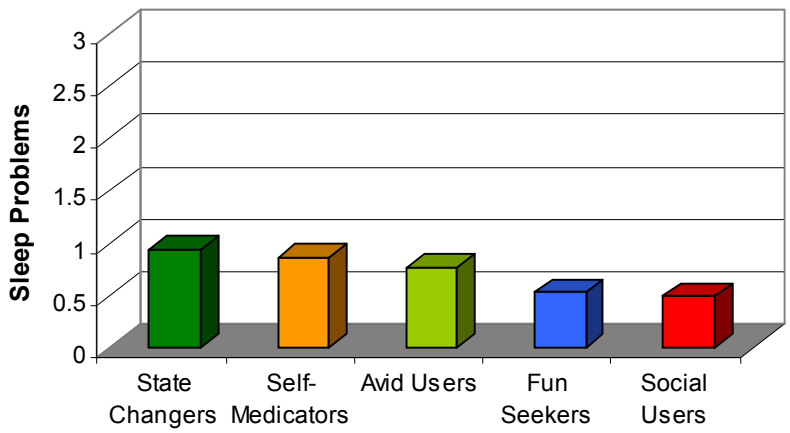

Figure 12.4. Sleep problems by cannabis user type

Childhood Lifestyle Factors

Environmental Factors

Sole Parent Family

Avid Users were the cannabis user type with the highest proportion of participants growing up in a sole parent family, followed by Social Users, State Changers, and Self-Medicators, while Fun Seekers were the group with the lowest proportion of participants from single parent families. To investigate differences in parental status, participants were assigned a score of 1 if they grew up in a single parent family and 0 if they had two parents/parental figures in their childhood home. A one-way ANOVA indicated that there

were no significant differences between the cannabis user types for this variable: $F(4, 778) = 1.55$, $p = .187$, $\eta^2 = .008$ (see Appendices M5 & M6).

Proxy SES (Parental)

The participants' parental proxy socioeconomic status was scored on a 9-point scale (2-10) where higher scores were indicative of lower proxy SES. A one-way ANOVA indicated that there were no significant differences between the cannabis user types for this variable: $F(4, 778) = 1.31$, $p = .266$, $\eta^2 = .007$ (see Appendices M5 & M6).

Family Dynamics & Domestic Violence

Participants were asked to report the frequency with which arguments in their childhood homes escalated to incidences of domestic violence. State Changers, with over half affected, were the most likely of the cannabis user types to report any exposure to domestic violence, followed by Avid Users, and Social Users, while Self-Medicators and Fun Seekers were the least likely, to have been exposed to domestic violence. The family dynamics in the participants' childhood home were assessed measured on scale ranging from 0-16, where higher score indicated poorer dynamics, while incidences of domestic violence were scored from 0 = 'never' to 4 = 'always'. While State Changers had the highest scores for both of these variables, one-way ANOVAs indicated that none of the cannabis user types differed significantly (see Appendices M5 & M6).

Family Addiction Problems

Participants were asked to report their level of exposure to addiction in their family home (e.g. alcohol, illicit substances, gambling, etc.). Avid Users were the most likely of the cannabis user types to report exposure to family addiction problems, followed by Self-Medicators, State Changers, and Social Users, while Fun Seekers were the least likely to have been exposed. Family addiction problems were scored on a 6-point scale (0-5), with higher score indicating more problems. A one-way ANOVA indicated a moderate between groups

effect for this variable: $F(4, 776) = 6.03$, $p < .001$, $\eta^2 = .031$ (see Appendices M5 & M6). Post hoc Tukey's HSD analyses indicated Avid Users ($M = 1.42$, $SD = 1.40$) were exposed to higher levels of family addiction problems than Fun Seekers ($M = 0.76$, $SD = 1.05$) and Social Users ($M = 0.97$, $SD = 1.15$) (see Appendix M7).

Traumatic Events

Self-Medicators were the cannabis user group who were most likely to have experienced all three of the traumatic events assessed in the present study (physical and sexual abuse, and the death of someone close to them), while Social Users were the group who were the least to have experienced all three of these events (see Table 12.8). To investigate differences in exposure to traumatic events during childhood, participants were assigned a score of 1 if they had been exposed and 0 if they had not experienced these events. The three one-way ANOVAs investigating physical abuse ($F[4, 753] = 3.41$, $p = .009$, $\eta^2 = .018$), sexual abuse ($F[4, 747] = 4.13$, $p = .003$, $\eta^2 = .022$), and the death of someone close ($F[4, 778] = 5.87$, $p < .001$, $\eta^2 = .029$) all indicated small between group effects (see Appendices M5 & M6). Further, for all of these variables, the post hoc Tukey's HSD analyses indicated that Self-Medicators were significantly more likely to experience the three traumatic events than Social Users (see Appendix M7).

Table 12.8

Traumatic Events Experienced by Cannabis User Type

	Physical Abuse		**Sexual Abuse**		**Death of Someone**	
	N	%	*N*	%	*N*	%
Social Users (*N* = 174)	29	17.3 %	14	8.5 %	41	23.6 %
Avid Users (*N* = 167)	39	24.4 %	24	15.2 %	53	31.7 %
Self-Medicators (*N* = 129)	45	35.7 %	30	24.2 %	63	48.8 %
Fun Seekers (*N* = 116)	27	23.9 %	20	17.9 %	39	33.6 %
State Changers (*N* = 193)	44	23.5 %	22	11.6 %	57	29.5 %

Lack of Adult Support

Participants in all five cannabis users groups were most likely to report always having an adult available for support or help while they were growing up. However, the proportion of each group endorsing this response differed greatly; from 47% of Fun Seekers to 29% of Self-Medicators. Conversely, Self-Medicators were most likely to report never having availability of adult support, and Fun Seekers the least likely to report this lack of support (see Table 12.9).

Table 12.9

Availability of Adult Support by Cannabis User Type

	Availability of Support				
	Always	Mostly	Sometimes	Hardly Ever	Never
Social Users (*N* = 174)	39.7 %	23.0 %	20.1 %	7.5 %	9.8 %
Avid Users (*N* = 167)	35.9 %	21.0 %	16.8 %	13.8 %	12.6 %
Self-Medicators (*N* = 129)	28.7 %	16.3 %	22.5 %	14.0 %	18.6 %
Fun Seekers (*N* = 116)	46.4 %	27.6 %	13.8 %	6.9 %	5.2 %
State Changers (*N* = 193)	36.3 %	27.5 %	13.5 %	13.0 %	9.8 %

The availability of adult support and help during childhood was measured on a 5-point scale, from 0 = 'always had someone for support' to 4 = 'never had someone for support'. A one-way ANOVA indicated a moderate between groups effect for this variable: $F(4, 778) = 6.09$, $p < .001$, $\eta^2 = .031$ (see Appendices M5 & M6). Post hoc Tukey's HSD analyses indicated Self-Medicators ($M = 1.78$, $SD = 1.47$) were significantly more likely to have experienced a lack of adult support during childhood than either Social Users ($M = 1.25$, $SD = 1.31$) or Fun Seekers ($M = 0.97$, $SD = 1.16$) (see Figure 12.7 and Appendix M7).

Individual Factors

Early Tobacco, Alcohol, and Substance Use

State Changers were the cannabis user group who were most likely to have used both tobacco and alcohol before they were 16 years of age, while Avid Users and Self-Medicators were equally most likely of the user groups to have used other illicit substances by the age of 16 years. In contrast, Social Users were the group who were the least to have used tobacco or other illicit substances before they were 16 years old, while Avid Users were the least likely of the cannabis user types to have initiated alcohol use before this age (see Table 12.10).

Table 12.10

Early Substance Use by Cannabis User Type

	Tobacco		**Alcohol**		**Other Substances**	
	N	%	*N*	%	*N*	%
Social Users (*N* = 174)	117	67.2 %	86	49.4 %	18	10.3 %
Avid Users (*N* = 167)	113	67.7 %	70	41.9 %	26	15.6 %
Self-Medicators (*N* = 129)	91	70.5 %	57	44.2 %	21	16.3 %
Fun Seekers (*N* = 116)	79	68.1 %	59	50.9 %	13	11.2 %
State Changers (*N* = 193)	146	75.6 %	104	53.9 %	25	13.0 %

The three one-way ANOVAs investigating early substance use (0 = 'no', 1 = 'yes') indicated that the cannabis user types did not differ significantly with regards to the use of tobacco ($F[4, 778] = 1.05$, $p = .379$, $\eta^2 = .005$), alcohol ($F[4, 778] = 1.60$, $p = .171$, $\eta^2 = .008$), or other substances ($F[4, 778] = 0.88$, $p = .475$, $\eta^2 = .005$) before 16 years of age (see Appendices M5 & M6).

Delinquent Behaviour

Engagement in delinquent behaviour during childhood/adolescence was measured on scale ranging from 0-45. A one-way ANOVA indicated a moderate between groups effect for this variable: $F(4, 778) = 5.97$, $p < .001$, $\eta^2 = .030$ (see Appendices M5 & M6). Post hoc Tukey's HSD analyses indicated Avid Users ($M = 10.02$, $SD = 6.84$) reported significantly higher levels of delinquent behaviour than either Social Users ($M = 7.05$, $SD = 6.07$) or Fun Seekers ($M = 7.45$, $SD = 5.96$) (see Figure 12.5 and Appendix M7).

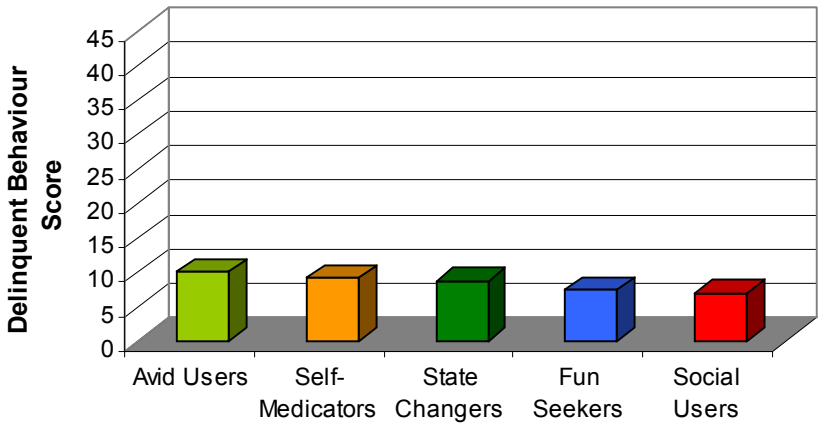

Figure 12.5. Delinquent behaviour by cannabis user type

Running Away from Home

Self-Medicators were the most likely to have run away from home, with 39% reporting that they had done so at some point before they were 16 years of age. Frequency of running away from home during childhood/adolescence was measured on a 4-point, from 0 = 'no running away' to 3 = 'high level running away'. A one-way ANOVA indicated a small between groups effect for this variable: $F(4, 778) = 4.36$, $p = .002$, $\eta^2 = .022$ (see Appendices M5 & M6). Post hoc Tukey's HSD analyses indicated Self-Medicators ($M = 0.65$, $SD = 0.97$)

ran away from home significantly more often than Social Users (M = 0.31, SD = 0.69) (see Appendix M7).

Childhood Psychopathology

Avid Users were most likely to have experienced psychopathology during childhood, with 55% affected. With 44% of group members reporting childhood psychopathology, Social Users were the least affected of the user types. Childhood levels of psychopathology were assessed on 4-point scale (0-3) where higher scores equated to higher levels of psychopathology. A one-way ANOVA indicated that the cannabis user types did not differ significantly on this variable: $F(4, 771) = 0.72$, $p = .579$, $\eta^2 = .004$ (see Appendices M5 & M6).

ADD/ADHD

Avid Users were the most likely, and Self-Medicators the least likely, of the cannabis user types to have received a diagnosis of ADD/ADHD, with 19% and 13% of group members being diagnosed with this condition, respectively. However, a one-way ANOVA indicated that there were no significant differences between the cannabis user groups for this variable (see Appendices M5 & M6).

Summary & Discussion

In the last chapter, the five cannabis user types were found to differ with regards to their current patterns of cannabis use, key aspects of use, and the subjective effects experienced in relation to use. In the present chapter these cannabis users have also been found to differ in relation to their demographic profiles and both current and childhood lifestyles.

The Cannabis User Types

Social Users

Social Users, at 32 years of age on average, were one of the oldest cannabis user types. Consisting of 28% females, Social Users had the lowest proportion of female participants of all the cannabis user types. Just under half of the Social Users were married or in a de facto relationship (44%). Social Users were the most highly educated of the cannabis user types, with 40% having attained a tertiary qualification, and the majority were employed (60%). Consistent with this, Social Users reported the highest average proxy SES level in comparison to the other cannabis user groups. They typically lived in suburban areas or large country towns (42%); however a third of this user group lived in urban areas.

Forty-two percent of the Social Users reported that most or all of their friends were cannabis users. Approximately a third (35%) of Social Users were daily tobacco smokers, with an equal number reporting no tobacco use in the previous 12 months. They typically used alcohol on a weekly basis, and the majority (52%) did not use illicit substances (excluding cannabis) in the month prior to participating in the present study. In comparison to the other cannabis user types, Social Users reported low levels of health issues and sleep problems. Social Users also recorded the lower sensation seeking scores than most of the other cannabis user types.

Approximately one in four (23%) Social Users grew up in a single-parent family, and 63% reported always or mostly having an adult they could turn to for support or help when they need it. They were also one of the least likely groups to have experienced adverse circumstances and/or events during their childhood/adolescence. However, 54% of Social Users were exposed to addiction problems in the family home, and 46% were exposed to domestic violence. Furthermore, by the time they were 16 years old, 24% had experienced the death of someone close to them, 17% had been physically abused, and 9% had been

sexually abused. Social Users had also typically engaged in tobacco use by the time they were 16 years old, with 67% having done so, while 49% had used alcohol and 10% had tried other illicit substances by this age. Approximately one in five (21%) Social Users had run away from home at least once before they were 16 years old, but they were the second least likely of the cannabis users types to have engaged in delinquent behaviour.

Avid Users

Avid Users, at 25 years of age on average, were one of the youngest cannabis user types. Approximately a third (34%) of Avid Users were female, and 32% were married or in a de facto relationship. They tended to have completed less education than the other cannabis user groups, but had typically attained some post school qualifications (51%). Avid Users were typically employed (44%), but many were also students (38%), while one in five was unemployed. On average, Avid Users reported the lowest Proxy SES level of all the cannabis user types. The majority of Avid Users lived in suburban areas or large country towns (53%), however approximately a third (30%) lived in urban areas.

Avid Users were the most likely of the cannabis user types to have friends who used cannabis, with 61% reporting that most or all of their friends were users. Almost half (48%) of Avid Users were daily tobacco smokers, with only 22% reporting that they were a non-smoker in the previous 12 months. They typically used alcohol on a weekly basis, and 42% did not use illicit substances (excluding cannabis) in the month prior to participating in the present study. In comparison to the other cannabis user types, Avid users reported moderate levels of health issues and sleep problems. Conversely, Avid Users recorded the highest sensation seeking scores of all the cannabis user types.

Over two-thirds (73%) of Avid Users grew up in two-parent families, and 57% reported always or mostly having an adult they could turn to for support or help when they need it. However, many experienced a number of adverse circumstances and/or events during their childhood/adolescence. Approximately two-thirds (65%) of Avid Users were

exposed to addiction problems in the family home, while 48% were exposed to domestic violence. Furthermore, before they were 16 years old, 32% experienced the death of someone close to them, 24% had been physically abused, and 15% had been sexually abused. Avid Users had also typically engaged in tobacco use by the time they were 16 years old, with 68% having done so. Fewer had tried alcohol or other illicit substances by this age (42% and 16%, respectively). Just over a third (35%) of Avid Users had run away from home at least once before they were 16 years old, and Avid Users had engaged in higher levels of delinquent behaviour than all other cannabis user types.

State Changers

State Changers, at 30 years of age on average, were in the middle of the age range for the cannabis user types. Approximately a quarter (28%) of were female, and 41% were married or in a de facto relationship. They had completed less education on average than most of the other cannabis user groups, but had typically attained some post school qualifications (42%). State Changers were typically employed (59%), and this was the group containing the smallest proportion of students (22%). The majority of State Changers lived in suburban areas or large country towns (53%), but 27% lived in urban areas.

Almost half (46%) of the State Changers reported that most or all of their friends used cannabis. Approximately a third (35%) of State Changers used tobacco on a daily basis, while a further 27% reported no tobacco use in the previous 12 months. They typically used alcohol on a weekly basis, and half had used illicit substances (excluding cannabis) in the month prior to participating in the present study. In comparison to the other cannabis user types, State Changers reported moderate levels of health issues and high levels of sleep problems. State Changers also recorded the moderate sensation seeking scores in comparison to the other cannabis user types.

One in five State Changers grew up in a single-parent family, and 64% reported always or mostly having an adult they could turn to for support or help when they need it.

However, many State Changers experienced a number of adverse circumstances and/or events during their childhood/adolescence. In total 57% of State Changers were exposed to addiction problems in the family home, and 53% were exposed to domestic violence. Additionally, before they were 16 years old, 36% experienced the death of someone close to them, 24% had been physically abused, and 12% had been sexually abused. State Changers were the user group with the highest proportion of early tobacco and alcohol users, with 76% and 54% (respectively) using before they were 16 years old. In contrast, only 13% had tried other illicit substances by this age. Just over a quarter (28%) of State Changers had run away from home at least once before they were 16 years old, and State Changers had engaged in a moderate amount of delinquent behaviour when compared to the other cannabis user types.

Self-Medicators

Self-Medicators were the oldest of all the cannabis user types, with a mean age of 38 years. Approximately a third (36%) of Self-Medicators were female, and 56% were married or in a de facto relationship. They tended to have completed more education than the other cannabis user groups, with 36% completing tertiary studies. Self-Medicators were typically employed (59%), but this group contained the largest proportion of unemployed participants (26%). The majority of Self-Medicators lived in suburban areas or large country towns (57%), however 23% lived in rural or remote areas.

Self-Medicators were the least likely of the cannabis user types to have friends who used cannabis, with only 30% reporting that most or all of their friends were users. The Self-Medicator user group contained the lowest proportion of tobacco smokers, with 39% reporting no use in the previous 12 months, however approximately a third (35%) of Self-Medicators were daily tobacco smokers. They also used alcohol less frequently than the other cannabis user types, typically consuming it less than monthly in the previous 12 months. In contrast, they were more likely than the other user types to be poly-substance users, with

30% consuming three or more illicit substances (excluding cannabis) in the month prior to study participation. Self-Medicators reported the highest level of health issues and the second highest level of sleep problems. Conversely, Self-Medicators recorded the lowest sensation seeking scores of all the cannabis user types.

The vast majority (81%) of Self-Medicators grew up in a two-parent family, however only 45% reported always or mostly having an adult they could turn to for support or help when they need it. Furthermore, many experienced a number of adverse circumstances and/or events during their childhood/adolescence. Approximately two-thirds (64%) of Self-Medicators were exposed to addiction problems in the family home, while 41% were exposed to domestic violence. Additionally, before they were 16 years old, 49% had experienced the death of someone close to them, 36% had been physically abused, and 24% had been sexually abused. Over two-thirds (71%) of Self-Medicators had used tobacco by the time they were 16 years old, while 44% had tried alcohol, and 16% had used other illicit substances by this age. In total 39% of Self-Medicators had run away from home at least once before they were 16 years old, and Self-Medicators had engaged in moderate levels of delinquent behaviour in comparison to the other cannabis user types.

Similarities & Differences

There were a number of similarities and differences indicated for the cannabis user types. The user types did not differ in relation to gender composition, their region of residence, or current poly-substance use. Interestingly, they also did not differ in relation to a number of childhood environmental factors, including the proportion that grew up in sole-parent families, parental proxy SES, and exposure to conflict and violence in the home. Further, the user types were similar with regard to their early use of tobacco, alcohol and other substances, levels of childhood psychopathology, and ADD/ADHD.

The user types were found to differ in relation to their current age (Self-Medicators oldest, Avid Users and Fun Seekers youngest) and other phase of life related factors, such as single marital status (Avid Users and Fun Seekers most likely, Self-Medicators least likely), levels of education (Social Users highest, Avid Users lowest), and proxy SES (Social Users highest, Avid Users lowest). There were also differences evident in relation to the frequency of use of alcohol (Self-Medicators lowest frequency) and tobacco (Avid Users more than Social Users), sensation seeking personality traits (Self-Medicators lower than all but Social Users), health problems (Self-Medicators most affected), sleep problems (State Changers and Self-Medicators more affected than Social Users and Fun Seekers), number of cannabis-using friends (Avid Users and State Changers more than other user types), and level of unemployment (Self-Medicators higher than Social Users and Fun Seekers). Additionally, in relation to childhood factors, group differences were indicated for exposure to family addiction problems (Avid Users more than Fun Seekers and Social Users), the lack of availability of adult support (Self-Medicators less support than Fun Seekers and Social Users), delinquent behaviour (Avid Users highest, Social Users and Fun Seekers lowest), running away from home (Self-Medicators highest, Social Users lowest), and exposure to traumatic events during childhood (Self-Medicators highest, Social Users lowest).

Thus, Social Users and Fun Seekers, who found to be relatively lighter cannabis users in Chapter 11, also tended to fall at the lower end of the range in relation to a number of the lifestyle items assessed in the present chapter. For example, they were both tended to be less likely to use tobacco regularly, were less likely to be unemployed, and reported lower levels of sleep and health problems than the other three cannabis user types. Moreover, in relation to childhood factors, Fun Seekers and Social Users tended to report the highest levels of adult support, were exposed to the lowest levels of family addiction problems and traumatic events assessed in the present study, engaged in less delinquent behaviour, and were less likely to have run away from home, than the other cannabis user types. These two groups

tend to differ most markedly in relation to demographic factors. However, with Social Users being seven years older on average than Fun Seekers, perhaps these two groups were simply in different phases of life. That is, Social Users were more likely to be married or in a de factor relationship, and more likely to be employed than Fun Seekers, who were typically still studying. A further difference between these groups related to their levels of sensation seeking traits, with Fun Seekers reporting higher levels, however, these may also be at least somewhat age related.

As with the cannabis use factors discussed in the previous chapter, State Changers were similar to Avid Users, with Avid Users tending to be slightly more extreme on most factors assessed in the present chapter. The two key differences between these groups were that State Changers were 5 years older on average and they reported more sleep problems than Avid Users. Self-Medicators were the group most different from the others, thus following the trend that was evident in relation to the cannabis use factors discussed in Chapter 11. This was the oldest group, the most likely to be married or in a de facto relationship, but were also the most likely to be unemployed. Self-Medicators used alcohol with the lowest frequency, reported experiencing high current levels of health and sleep problems, were the most likely to have experienced trauma during childhood, and were more likely to have runway from home than the other cannabis user types.

Conclusions

With regard to current lifestyle factors, a number of the differences were associated with phase of life. However there was also evidence of the groups following different trajectories in relation to education and employment pathways. For example, of the two youngest groups, Fun Seekers were more likely to have university qualifications and most were current students, while Avid Users had the lowest education levels of all user types, and the lowest proxy SES. Similarly, Social Users were more educated than the similarly aged

Changers, and had the highest proxy SES, while Self-Medicators, the oldest group on average, were the most likely to have not completed high school, and the most likely to be unemployed. Additional differences were evident for childhood experiences. Fun Seekers and Social Users were less likely than the other cannabis user types to have been exposed to adverse circumstances or events. In contrast, State Changers and Avid Users tended to experience negative home environments, and Self-Medicators tended to have been exposed to a greater level of trauma during childhood/adolescence, coupled with less availability of adult support.

When these profiles are compared those for the user types identified by Kandel and Chen (2000), Avid Users appear to be similar to Early Onset – Heavy User group, particularly in relation to the high levels of adolescent delinquent behaviour, risk-taking/sensation seeking personality traits, the use of other substances, and the in experiencing a relatively high number of cannabis-use related problems. Additionally, Fun Seekers seem to be most similar to Early Onset – Light Users, and Self-Medicators share some characteristics with Late Onset – Light Users. However neither Social Users nor State Changers resemble Mid Onset – Heavy Users.

Unfortunately, it is not really possible to compare the user types in the present study with those identified by Windle and Wiesner (2004) or Ellickson, Martino, and Collins (2004) due to the later two typologies being longitudinal in approach. That is, the present study does not contain comparable data in terms of individual participants' patterns of cannabis use over adolescence/young adulthood. Nevertheless, with the data available, Avid Users appear to be similar to Windle and Wiesner's High Chronic users (e.g., high delinquent behaviour, high substance use).

With regards to Miller and Plant's (2002) three teenage cannabis users types, it appears that Fun Seekers and Social Users are most similar to the Ordinary users, Avid Users and State Changers are similar to the Antisocial users, while the Self-Medicators resemble the

Unhappy users. Miller and Plant's (2002) Ordinary users tended to have good relationships with parents and friends, scored lowest on delinquent and aggressive behaviour, and typically used cannabis for fun. Antisocial users had more difficult relationships with their families, but strong friendship groups, and engaged in the highest levels of delinquent and aggressive behaviours; their cannabis use was seen as part of an overall rule-breaking behavioural pattern. Unhappy users were the least likely to receive warmth, caring or mental support from their parents, and reported poor parental relationships; they were deemed to be using cannabis to 'self-medicate' in relation to self-esteem, depression and relationship issues.

Thus, it is possible that the differences between Fun Seekers and Social Users, and between Avid Users and State Changers, are primarily temporal. That is, Social Users and State Changers may be older Fun Seekers and Avid Users (respectively), with their patterns of cannabis use and current lifestyles somewhat modified inline with being in a different phase of life. Nevertheless, these groups do differ on a number of factors that would be likely to impact on the types of services and treatment plans that would be most appropriate for them, if they were to seek assistance with regard to cannabis use-related issues. The level of impairment in everyday functioning experienced by the cannabis user types is addressed in the next chapter.

Due to the patterns of cannabis use revealed in Chapter 11, it was proposed that Fun Seekers and Social Users would be likely to experience lower levels of impairment in their everyday life that the other three cannabis user types, with State Changers and Avid Users likely to experience the highest levels of difficulties in fulfilling their daily activities and meeting responsibilities. The information covered in the present chapter provides further support for these expected group differences.

CHAPTER 13

THE EVERYDAY FUNCTIONING OF THE CANNABIS USER TYPES

Introduction

The fourth objective of this investigation is the development of a cannabis user typology. It is apparent from the findings reported in Chapter 11 that there were large differences between the five identified user types with regards to their current and past patterns of cannabis use. Additionally, in Chapter 12, the user types were found to differ in relation to a number of current and childhood lifestyle factors that were previously found to be associated with current levels of psychopathology (Chapter 9) and cognitive functioning (Chapter 10). Thus, it is hypothesized that the cannabis user types experience disparate levels of impairment in their everyday functioning, with Avid Users likely to be the most affected of the user types.

The first section of this chapter investigates the current psychological wellbeing of the cannabis user types, while the second section explores their levels of cognitive functioning. The third section provides an assessment of the level of impairment the different user types are likely to experience in their ability to undertake their usual daily activities and fulfill their responsibilities, and the likelihood of participants experiencing impaired functioning is determined. The final section of the chapter provides a summary of all information presented here and a discussion of relevant issues.

Psychopathology

Psychological Distress & Wellbeing

Psychological Wellbeing

The MHI-18 index is an overall measure of psychological health with a scoring range of 0-100, where higher scores indicate greater psychological wellbeing. The mean MHI-18 index score for the participants who had used cannabis in the previous year (N = 779) was 68.77 (SD = 16.52). A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 9.83$, $p < .001$, $\eta^2 = .048$ (see Appendices N1 & N2). A post hoc Tukey's HSD analysis indicated that Social Users (M = 73.97, SD = 14.02) reported significantly higher levels of psychological wellbeing than Avid Users (M = 63.97, SD = 18.00) and State Changers (M = 66.68, SD = 17.35). Fun Seekers (M = 71.52, SD = 12.69) also reported significantly higher levels of psychological wellbeing than Avid Users (see Figure 13.1 and Appendix N3).

Depression

The MHI-18 depression subscale is scored from 0-100, with higher scores indicating higher levels of depressed mood. The mean depression subscale score for the participants who had used cannabis in the previous 12 months (N = 779) was 41.20 (SD = 15.50). A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 10.60$, $p < .001$, $\eta^2 = .052$ (see Appendices N1 & N2). A post hoc Tukey's HSD analysis indicated that Avid Users (M = 45.88, SD = 16.87) reported significantly higher levels of depression than Social Users (M = 35.99, SD = 12.48) and Fun Seekers (M = 39.08, SD = 12.44). State Changers (M = 43.24, SD = 16.17) also reported significantly higher levels of depression than Social Users (see Figure 13.1 and Appendix N3).

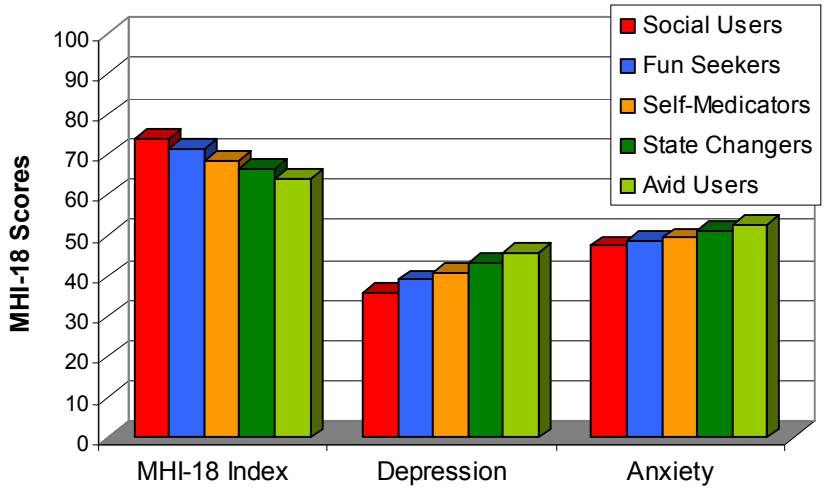

Figure 13.1. MHI-18 scores by cannabis user group

Anxiety

The MHI-18 anxiety subscale is scored from 0-100, with higher scores indicating higher levels of anxiety. The mean anxiety subscale score for the participants who had used cannabis in the previous 12 months (N = 779) was 50.03 (SD = 12.10). A one-way ANOVA indicated a small between groups effect: $F(4, 778) = 4.70$, $p = .001$, $\eta^2 = .024$ (see Figure 13.1 and Appendices N1 & N2). A post hoc Tukey's HSD analysis (see Appendix N3) indicated that Avid Users (M = 52.63, SD = 12.62) reported significantly higher levels of anxiety than Social Users (M = 47.53, SD = 10.37).

Severity of Psychological Distress

Approximately one in four (26%) of the participants who had used cannabis in the previous year were classified with some level of depression. As can be seen in Table 13.1, Avid Users were most likely to be affected, with 29% classified as being depressed. In contrast, with 7% of participants classified with depression, Fun Seekers were the least likely of the cannabis user types to have depressed members.

Table 13.1
MHI-5 Depression Groups

	Not depressed		**Moderate depression**		**Severe depression**	
	N	%	*N*	%	*N*	%
Fun Seekers (*n* = 116)	108	93.1 %	7	6.0 %	1	0.9 %
Social Users (*n* = 174)	155	89.1 %	13	7.5 %	6	3.4 %
Self-Medicators (*n* = 129)	107	82.9 %	10	7.8 %	12	9.3 %
State Changers (*n* = 193)	153	79.3 %	18	9.3 %	22	11.4 %
Avid Users (*n* = 167)	119	71.3 %	23	13.8 %	25	15.0 %

Psychotic Symptomology

Adjusted SPQ-B Total Score

The adjusted SPQ-B total score is an overall measure of psychotic symptomology with a scoring range of 0-20, where higher scores indicate higher levels of symptomology. The mean adjusted SPQ-B total score for the participants who had used cannabis in the previous year (N = 779) was 7.34 (SD = 4.49). A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 11.06$, $p < .001$, $\eta^2 = .054$ (see Appendices N1 & N2). A post hoc Tukey's HSD analysis (Appendix N3) indicated that Avid Users (M = 9.17, SD = 4.52) reported significantly higher levels of psychotic symptomology than Social Users (M = 6.19, SD = 4.41), Fun Seekers (M = 6.72, SD = 4.16), Self-Medicators (M = 7.00, SD = 4.18), and State Changers (M = 7.40, SD = 4.48).

Positive Symptomology

The adjusted SPQ-B cognitive-perceptual factor score is a measure of positive psychotic symptomology with a scoring range of 0-7, where higher scores indicate higher levels of positive symptomology. The mean adjusted SPQ-B cognitive-perceptual factor score for the participants who had used cannabis in the previous year (N = 779) was 2.44

(*SD* = 1.88). A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 9.05$, $p < .001$, $\eta^2 = .045$ (see Appendices N1 & N2). A post hoc Tukey's HSD analysis indicated that Avid Users (*M* = 3.16, *SD* = 1.81) reported significantly higher levels of positive psychotic symptomology than all of the other cannabis user types (see Figure 13.2 and Appendix N3).

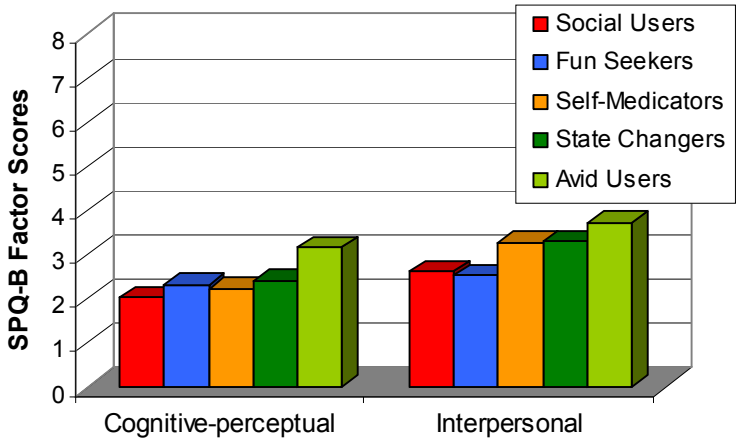

Figure 13.2. SPQ-B factor scores by cannabis user group

Negative Symptomology

The SPQ-B interpersonal factor score is a measure of negative psychotic symptomology with a scoring range of 0-8, where higher scores indicate higher levels of positive symptomology. The mean SPQ-B interpersonal factor score for the participants who had used cannabis in the previous year (*N* = 779) was 3.12 (*SD* = 2.34). A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 7.22$, $p < .001$, $\eta^2 = .036$ (see Appendices N1 & N2). A post hoc Tukey's HSD analysis (Appendix N3) indicated that Avid Users (*M* = 3.72, *SD* = 2.31) reported significantly higher levels of negative psychotic symptomology than Social Users (*M* = 2.62, *SD* = 2.30) and Fun Seekers (*M* = 2.53, *SD* = 2.15).

Severity of Psychotic Symptomology

Only 6% of the participants who had used cannabis in the previous year were classified with a high level of psychotic symptomology. As can be seen in Table 13.2, Avid Users were most likely to be affected, with 11% classified with high levels of psychotic symptomology. In contrast, with 2% of participants classified with high levels, Self-Medicators were the least likely of the cannabis user types to have members with high levels of psychotic symptomology. However, Social Users were the most likely of the user types to have members classified with low levels of symptomology.

Table 13.2
Psychotic Symptomology Groups

	Low symptomology		**Moderate symptomology**		**High symptomology**	
	N	%	*N*	%	*N*	%
Self-Medicators (*n* = 129)	16	12.4 %	110	85.3 %	3	2.3 %
Fun Seekers (*n* = 116)	15	12.9 %	97	83.6 %	4	3.4 %
Social Users (*n* = 174)	28	16.1 %	139	79.9 %	7	4.0 %
State Changers (*n* = 193)	20	10.4 %	161	83.4 %	12	6.2 %
Avid Users (*n* = 167)	5	3.0 %	143	85.6 %	19	11.4 %

Cognitive Function

Cognitive Failures

The CFQ total score reflects the frequency of cognitive slips in perception, memory and motor function. It has a scoring range of 0-100, where higher scores indicate more cognitive failures. The mean CFQ total score for the participants who had used cannabis in the previous year (*N* = 779) was 34.65 (*SD* = 15.78). A one-way ANOVA indicated a large

between groups effect: $F(4, 778) = 24.95$, $p < .001$, $\eta^2 = .114$ (see Appendices N4 & N5). A post hoc Tukey's HSD analysis indicated that Avid Users ($M = 42.96$, $SD = 17.24$) reported significantly higher numbers of cognitive failures than all of the other cannabis user types (see Figure 13.3 and Appendix N3). Additionally, Fun Seekers ($M = 35.84$, $SD = 13.87$) and State Changers ($M = 35.60$, $SD = 15.88$) reported significantly higher numbers of cognitive failures than Social Users ($M = 27.79$, $SD = 13.43$).

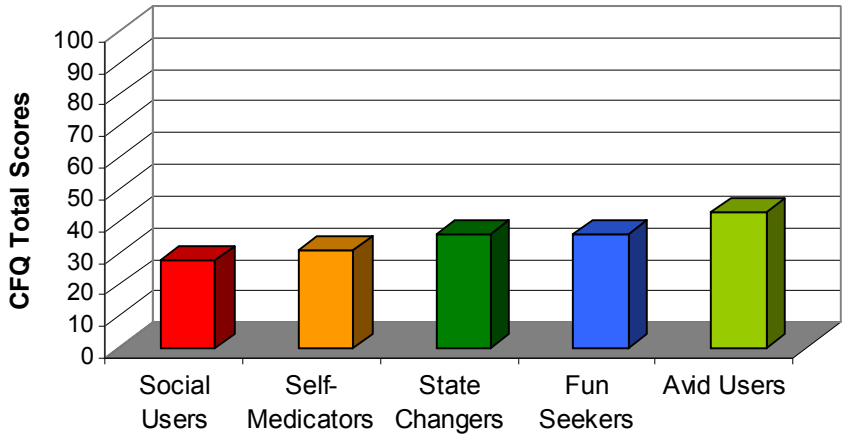

Figure 13.3. CFQ total scores by cannabis user group.

Memory Failures

The CFQ memory factor assesses memory failures and forgetfulness. It has a scoring range of 0-32, where higher scores indicate more memory failures. The mean memory factor score for the participants who had used cannabis in the previous year ($N = 779$) was 8.09 ($SD = 4.45$). A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 17.83$, $p < .001$, $\eta^2 = .084$ (see Appendices N4 & N5). A post hoc Tukey's HSD analysis indicated that Avid Users ($M = 10.52$, $SD = 6.34$) reported significantly higher numbers of memory failures than all of the other cannabis user types except Fun Seekers (see Appendix N3). While Fun Seekers ($M = 8.54$, $SD = 5.21$) and State Changers ($M = 8.40$, $SD = 5.39$)

reported significantly higher numbers of memory failures than Social Users (M = 6.06, SD = 4.42)

Distractibility

The CFQ distractibility factor assesses ability to successfully deal with perceptual aspects of divided-attention tasks. It has a scoring range of 0-36, where higher scores indicate more issues with distractibility. The mean distractibility factor score for the participants who had used cannabis in the previous year (N = 779) was 14.74 (SD = 6.19). A one-way ANOVA indicated a large between groups effect: $F(4, 778) = 25.06$, $p < .001$, $\eta^2 = .115$ (see Appendices N4 & N5). A post hoc Tukey's HSD analysis indicated that Avid Users (M = 12.05, SD = 5.65) reported significantly higher numbers of distractibility problems than all of the other cannabis user types except Fun Seekers (see Figure 13.4 and Appendix N3). While Fun Seekers (M = 15.70, SD = 5.44) and State Changers (M = 14.99, SD = 5.96) reported significantly higher numbers of distractibility problems than Social Users (M = 12.05, SD = 5.65), and Fun Seekers also scored higher than Self-Medicators (M = 13.05, SD = 5.11).

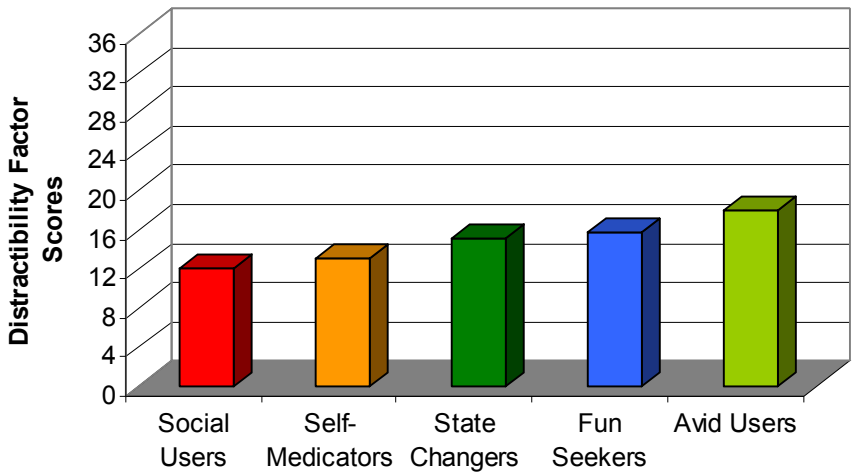

Figure 13.4. CFQ distractibility factor scores by cannabis user group.

Everyday & Prospective Memory

The EPM score reflects frequency of errors in everyday and prospective memory. It has a scoring range of 0-60, where higher scores indicate more memory errors. The mean EPM score for the participants who had used cannabis in the previous year (N = 779) was 16.65 (SD = 9.97). A one-way ANOVA indicated a medium between groups effect: $F(4, 778) = 20.59$, $p < .001$, $\eta^2 = .096$ (see Appendices N4 & N5). A post hoc Tukey's HSD analysis indicated that Avid Users (M = 21.85, SD = 11.28) reported significantly higher numbers of everyday and prospective memory problems than all of the other cannabis user types (see Figure 13.5 and Appendix N3). Additionally, State Changers (M = 16.70, SD = 9.46) reported significantly higher numbers of everyday and prospective memory problems than Social Users (M = 12.85, SD = 8.67).

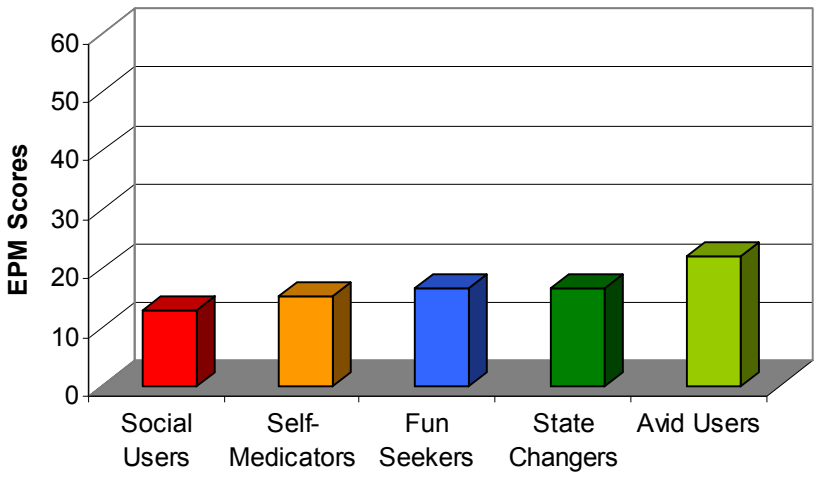

Figure 13.5. EPM scores by cannabis user group.

Severity of Cognitive Deficits

Only 14% of the participants who had used cannabis in the previous year were classified with a high level of cognitive failures. As can be seen in Table 13.3, Avid Users

were most likely to be affected, with 29% classified with high levels of cognitive functioning problems. In contrast, with 6% of participants classified with high levels, Self-Medicators and Social Users were the least likely of the cannabis user types to have members experiencing high levels of cognitive failures.

Table 13.3
Cognitive Failure Groups

	Low cognitive failures		**High cognitive failures**	
	N	%	*N*	%
Self-Medicators (*n* = 129)	121	93.8 %	8	6.2 %
Social Users (*n* = 174)	163	93.7 %	11	6.3 %
Fun Seekers (*n* = 116)	101	87.1 %	15	12.9 %
State Changers (*n* = 193)	168	87.0 %	25	13.0 %
Avid Users (*n* = 167)	119	71.3 %	48	28.7 %

Everyday Functioning

Problems Associated with Use

As reported in Chapter 11, Avid Users reported experiencing significantly more cannabis use-related problems than Self-Medicators, Fun Seekers, and Social Users. Additionally, State Changers reported significantly more problems than Fun Seekers and Social Users. Of interest here are the individual questionnaire items, or more specifically, the insight we can gain from the participants' self-attributed use-related problems and what they tell us about the nature of the participants' everyday functioning (see Table 13.4).

Table 13.4

Self-Attributed Problems Associated with Cannabis Use by User Types

	Fun Seekers (*n* = 116)	**Social Users** (*n* = 174)	**Self-Medicators** (*n* = 129)	**State Changers** (*n* = 193)	**Avid Users** (*n* = 167)
Interpersonal problems					
Problems with parents	9.5 %	16.7 %	16.3 %	29.5 %	29.9 %
Problems with partner/ spouse or boy/girlfriend	6.0 %	6.3 %	14.7 %	18.7 %	21.0 %
Problems with friends	8.6 %	4.6 %	5.4 %	10.9 %	10.8 %
Any interpersonal problem	**18.1 %**	**19.0 %**	**27.9 %**	**40.9 %**	**41.3 %**
Problems with external world					
Problems with study/work	12.9 %	10.9 %	9.3 %	16.6 %	25.1 %
Financial problems	12.1 %	9.2 %	15.5 %	22.8 %	29.3 %
Legal problems	4.3 %	4.6 %	15.5 %	14.5 %	15.0 %
Any external world problem	**19.8 %**	**17.8 %**	**34.1 %**	**38.3 %**	**49.1 %**
Personal wellbeing					
Psychological problems	6.0 %	8.0 %	6.2 %	11.9 %	18.0 %
Physical health problems	6.9 %	5.2 %	6.2 %	9.3 %	10.8 %
Any wellbeing problem	**9.5 %**	**10.9 %**	**9.3 %**	**15.0 %**	**22.8 %**
ANY USE-RELATED PROBLEM	**29.3 %**	**31.6 %**	**49.6 %**	**54.9 %**	**63.5 %**

It is evident, in Table 13.4, that a very high proportion of the participants felt that at least some problems in their everyday life were related to their cannabis use. Surprisingly, almost two-thirds of Avid Users reported experiencing use-related problems, with their dealings with the external world (work/study, financial, and legal problems) being most affected. A problem dealing with the external world was also the type of cannabis use-related

problem most commonly reported by the 50% of Self-Medicators and 30% of Fun Seekers reporting any use-related problems. Over half of the State Changers and approximately a third of Social Users reported experiencing use-related problems; with interpersonal problems the most affected area of their lives. Interestingly, use-related personal wellbeing problems (psychological or physical health) were reported by the lowest proportion of participants in all user groups. Further, Social Users, Self-Medicators, State Changers, and Avid Users, were more likely to report problems with their parents than any other use-related problem. In contrast, Fun Seekers were more likely to report problems with work or study than any other problem.

Impairment in Everyday Functioning

As noted in Chapter 9, Jablensky et al. (2000) found that individuals who were experiencing psychotic disorders suffered considerable levels of impairment in daily living, with up to 49% identified as being unable to fulfill their usual daily household activities and 46% exhibiting impaired performance in their main occupational role. Individuals with high levels of cognitive failures also encounter functional difficulties in daily life (Wagle, Berrios, & Ho, 1999). Further, individuals experiencing depression have been found to be unable to fulfill their usual daily activities on an average 2.7 days per four weeks, while individuals reporting comorbidity between affective, anxiety and substance use disorders (2 or more of these conditions) have approximately 3.5 days out of role in a four week period. In contrast, individuals with non-comorbid substance use disorders do not tend to report higher numbers of days out of role than the level reported by people without any disorders (Henderson, Andrews, & Hall, 2000).

Based on these past research findings, we would expect that up to 46% of Avid Users would have been likely to have impaired everyday functioning (see Table 13.5). This was substantially higher than the proportion of affected members belonging to each of the other

Table 13.5
Participants by Psychopathology, Proxy Dependence, and Cognitive Functioning

	Social Users (*n* = 174)	**Fun Seekers** (*n* = 116)	**Self-Medicators** (*n* = 129)	**State Changers** (*n* = 193)	**Avid Users** (*n* = 167)
High psychotic symptoms only	1.1 %	1.7 %	0.0 %	1.6 %	1.8 %
Plus depression	2.9 %	0.0 %	0.8 %	1.6 %	1.2 %
Plus cognitive impairment	0.0 %	0.9 %	0.0 %	0.5 %	0.0 %
Plus proxy dependence	0.0 %	0.9 %	0.0 %	0.0 %	0.6 %
Plus depression & cognitive impairment	0.0 %	0.0 %	1.6 %	1.6 %	4.2 %
Plus depression & proxy dependence	0.0 %	0.0 %	0.0 %	1.0 %	1.2 %
Plus cognitive impairment & proxy dependence	0.0 %	0.0 %	0.0 %	0.0 %	1.2 %
Plus depression, cognitive impairment & proxy dependence	0.0 %	0.0 %	0.0 %	0.0 %	1.2 %
Depression only	5.7 %	1.7 %	10.1 %	8.8 %	7.2 %
Plus cognitive impairment	1.1 %	4.3 %	0.8 %	2.1 %	4.8 %
Plus proxy dependence	1.1 %	0.0 %	2.3 %	3.1 %	4.8 %
Plus cognitive impairment and proxy dependence	1.1 %	0.9 %	1.6 %	2.6 %	4.2 %
Cognitive impairment only	3.4 %	6.0 %	2.3 %	3.6 %	6.0 %
Plus proxy dependence	0.0 %	0.9 %	0.0 %	2.6 %	7.2 %
ALL WITH IMPAIRED DAILY FUNCTIONING	**15.9 %**	**17.3 %**	**19.5 %**	**29.1 %**	**45.6 %**
Proxy dependence only	4.0 %	3.4 %	7.0 %	9.3 %	14.4 %
No Disorders	79.9 %	79.3 %	73.6 %	61.7 %	40.1 %
ALL WITH NORMAL DAILY FUNCTIONING	**83.9 %**	**82.7 %**	**80.6 %**	**71.0 %**	**54.5 %**

cannabis user groups: with 16 % of Social Users, 17% of Fun Seekers, 20% of Self-Medicators, and 29% of State Changers also reporting levels of psychopathology, cognitive failures, and comorbid dependence that are likely to result in some level of impaired everyday functioning. This impairment is typically psychopathology-related, with comorbid dependence implicated in 11% of the impairment experienced by Social Users, 16% of that experienced by Fun Seekers, and 20% of Self-Medicators' impairment. However, comorbid dependence was associated with 32% of the impairment experienced by State Changers, and 45% of the impairment experienced by Avid Users.

A one-way ANOVA was employed to investigate these differences in everyday functioning (0 = 'no impairment', 1 = 'impaired functioning'). The 210 participants who had not used cannabis in the previous 12 months were included in this analysis as a control group. A medium between groups effect was indicated: $F(5, 988) = 10.89$, $p < .001$, $\eta^2 = .052$ (see Appendices N7 & N8). Post hoc Tukey's HSD analyses indicated that on average Avid Users ($M = 0.46$, $SD = 0.50$) were significantly more likely to have impaired daily functioning than the other cannabis user types. Further, participants in the Non-User group ($M = 0.33$, $SD = 0.47$) were more likely to be impaired than Social Users ($M = 0.16$, $SD = 0.37$) (see Figure 13.6 and Appendix M4).

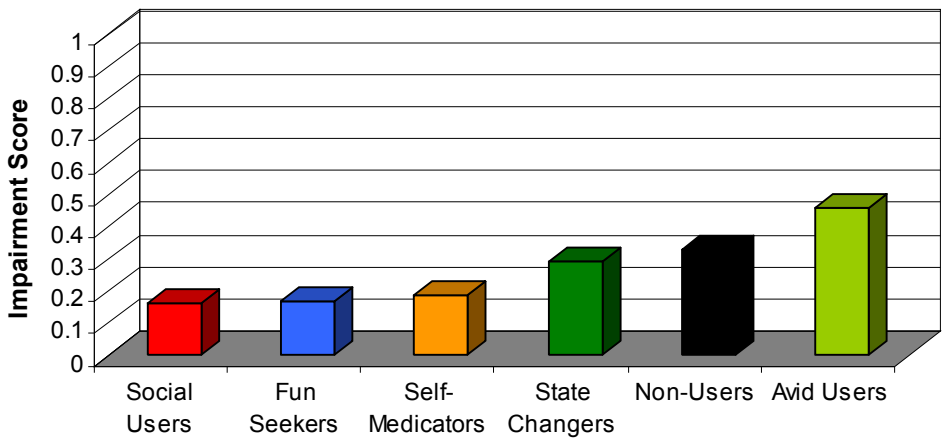

Figure 13.6. Level of impairment in daily functioning by cannabis user group

Thus, a high proportion of the Non-User group (33%) was likely to experience some level of impairment in everyday functioning. In total 22% of the non-cannabis using participants were classified as experiencing depression, 7% reported experiencing high levels of psychotic symptomology, and 15% reported high levels of cognitive failures.

Likelihood of Experiencing Impaired Everyday Functioning

Odds ratios were calculated to determine which lifestyle and cannabis use factors placed participants at a high level of risk for experiencing impairment in their ability to function in day-to-day life (see Table 13.6). For these analyses all 989 participants were categorised into two groups; those who were classified as having impaired functioning (*N* = 274; 'impaired' = 1), and those who were unaffected (*N* = 715; 'non-impaired' = 2). The dichotomised lifestyle and cannabis use factors were those previously utilised in Chapters 9 and 10.

It is evident in Table 13.6 that participants who met proxy dependence criteria were at an increased level of risk for experiencing impaired functioning, as were participants who had been using cannabis for shorter durations. There was also a slight increase in risk associated with early onset of cannabis use. With regards to demographics, the participants most likely to experience impaired functioning were female, young, single, unemployed, with low proxy SES and low levels of education. Daily smokers were at an increased level of risk for experiencing impairment, while poly-substances were slightly more likely to be impaired than participants who did not user these substances. Participants reporting health and sleep problems were more likely to experience impaired functioning than participants without these conditions. Three childhood factors were also implicated as risk factors for later impairment in daily functioning. These were not having adult support available when needed, engaging in high levels of delinquent behaviour and experiencing childhood psychopathology.

Table 13.6
Participants Meeting Risk Factor Criteria and Odds Ratio for Impaired Everyday Functioning

	Impaired (*N* = 274)		**Not Impaired** (*N* = 715)			
	N	%	*N*	%	**OR**	**95% CI**
Key Cannabis Use Factors						
Early use	125	45.6 %	272	38.0 %	1.37 *	1.03 – 1.81
Daily use	184	67.2 %	476	72.1 %	1.03	0.76 - 1.38
Prolonged use	91	38.7 %	313	49.5 %	0.64 **	0.48 - 0.87
Dependent use	63	23.0 %	64	9.0 %	3.04 ***	2.08 - 4.45
Current Lifestyle Factors						
Demographic & Environmental						
Female	132	42.8 %	240	33.6 %	1.84 ***	1.39 - 2.44
Young	139	50.7 %	267	37.3 %	1.73 ***	1.30 - 2.29
Single	194	70.8 %	384	53.7 %	2.09 ***	1.55 - 2.82
Unemployed	59	21.5 %	90	12.6 %	1.91 ***	1.33 - 2.74
Low SES (self)	226	82.5 %	500	69.9 %	2.02 ***	1.43 - 2.87
Low education	101	36.9 %	172	24.1 %	1.84 ***	1.37 - 2.49
Urban	71	25.9 %	206	28.8 %	0.86	0.63 - 1.18
Friends use cannabis	163	59.5 %	418	58.5 %	1.04	0.79 - 1.39
Individual						
High alcohol use	28	10.2 %	81	11.3 %	0.98	0.57 - 1.40
High tobacco use	146	53.3 %	281	39.3 %	1.76 ***	1.33 - 2.33
Poly-substance use	141	51.5 %	309	43.2 %	1.39 *	1.05 - 1.84
High sensation seeking	93	33.9 %	207	29.0 %	1.26	0.94 - 1.70
Poor health	147	53.6 %	246	34.4 %	2.21 ***	1.66 - 2.93
Sleep problems	173	63.1 %	286	40.0 %	2.57 ***	1.93 - 3.43
Childhood Lifestyle Factors						
Environmental						
Sole parent family	68	24.8 %	153	21.4 %	1.21	0.87 - 1.68
Low SES (parental)	101	36.9 %	251	35.1 %	1.08	0.81 - 1.44
Family addiction	163	59.7 %	388	54.3 %	1.25	0.94 - 1.65
High conflict	49	18.2 %	129	18.3 %	1.00	0.69 - 1.43
Domestic violence	129	47.1 %	316	44.2 %	1.12	0.85 - 1.49
Death of someone close	97	35.4 %	219	30.6 %	1.24	0.93 - 1.67
Physical abuse	70	26.6 %	165	23.8 %	1.16	0.84 - 1.61

Table 13.6 continued

	Impaired (*N* = 274)		**Not Impaired** (*N* = 715)			
	N	%	*N*	%	**OR**	**95% CI**
Sexual abuse	42	16.2 %	99	14.3 %	1.16	0.78 - 1.72
No adult support	147	53.6 %	262	36.6 %	2.00 ***	1.51 - 2.65
Individual						
Early tobacco use	197	71.9 %	468	65.5 %	1.35	1.00 - 1.83
Early alcoho/ use	135	49.3 %	332	46.4 %	1.12	0.85 - 1.48
Early substance use	41	15.0 %	80	11.2 %	1.40	0.93 - 2.10
High delinquent behaviour	111	40.5 %	197	27.6 %	1.79 ***	1.34 - 2.40
Ran away from home	89	32.5 %	187	26.2 %	1.36 *	1.00 - 1.84
Childhood psychopathology	171	63.3 %	301	42.3 %	2.35 ***	1.76 - 3.14
ADD/ADHD	49	18.1 %	110	15.5 %	1.20	0.83 - 1.74

* $p < .05$, ** $p < .01$, *** $p < .001$

Summary & Discussion

The Cannabis User Types

After considering the user type differences in relation to patterns of cannabis use and both current and childhood lifestyles, it was proposed that the cannabis user types would experience disparate levels of impairment in their everyday functioning. Further, it was hypothesised that Avid Users would be the most adversely affected of the user types. It is clear from the results presented in this chapter that this hypothesis was upheld: Avid Users experienced the highest levels of depression, anxiety, positive and negative psychotic symptomology, cognitive failures, and memory problems. They also reported the lowest levels of psychological wellbeing. Further, Avid Users contained the highest proportion of members who were likely to be experiencing levels of impairment in their everyday functioning commensurate with difficulties in performing daily activities and fulfilling responsibilities. Avid Users also reported experiencing the highest level of self-attributed

problems associated with their cannabis use. Overall, 46% of Avid Users were assessed as being likely to have impaired everyday functioning, while 64% reported experiencing use-related problems.

As was evident in the previous two chapters, there was a pattern of results for the cannabis user types. State Changers reported the second highest levels of psychopathology, cognitive functioning problems, impairment in everyday functioning, and number of use-related problems, followed by Self-Medicators, while Fun Seekers and Social Users tended to report the lowest levels of all variables. The only aberrant results were evident in relation to the some of the cognitive functioning results, where Fun Seekers reported the second highest levels of cognitive failures, and the user group with the lowest proportion of participants classified with high psychotic symptomology was the Self-Medicators. However, the pattern was evident in relation to both the assessed levels of impairment in everyday functioning and the self-reported experiences of use-related problems. Overall, 29% of State Changers were assessed as being likely to have impaired everyday functioning, while 55% reported experiencing use-related problems. For Self-Medicators the respective figures were 20% and 50%, for Fun Seekers they were 17% and 29%. The user group with the lowest proportion of participants assessed as being likely to experience impaired everyday functioning was the Social Users, with 16% affected, however 32% of Social Users reported experiencing use-related problems.

It is evident that a higher proportion of the participants in each user group reported experiencing use-related problems than the proportion that was assessed as being likely to encounter problems in their everyday functioning. However, it is important to note that the use-related problems endorsed by the participants may have been infrequent or even one-off events. In contrast, the levels of depression, psychotic symptomology, cognitive failures, and proxy dependence used to classify the participants in relation to their level of everyday

functioning are all likely to have a substantial and enduring impact on an individual's ability to perform the tasks needed to meet the demands of daily life, unless treatment is sought.

Everyday Functioning

Australian population level data indicates that approximately 6% of adults experience depressive disorders each year (Henderson, Andrews, & Hall, 2000). Thus, Fun Seekers, with 7% of group members affected were not dissimilar to general population prevalence levels. However, the proportion of the other users groups affected by depression was higher than would be expected in relation to general population levels of depression. The level of psychotic symptomology in all of the cannabis users groups was higher (and sometimes substantially so) than the Australian population level estimates of approximately 0.5% of adults experiencing psychotic disorders each year (Jablensky et al., 2000).

Impaired everyday functioning was found to be associated with proxy cannabis dependence and shorter durations of use, while there was a weak association indicated for early onset of cannabis use. However, in light of the results presented in earlier chapters, these associations are likely to be related to the demographic and lifestyle factors which were also found to be associated with increased likelihoods of experiencing impaired functioning. These factors included female gender, younger age, single marital status, unemployment, low proxy SES, low educational attainment, daily tobacco use, and health and sleep problems. A lack of adult support during childhood, delinquent behaviour, and childhood psychopathology were also implicated as risk factors for later impairment in daily functioning. It is possible that the impaired functioning of affected participants may have contributed to their current life circumstances. For example, cognitive impairment would be expected to adversely affect educational and occupational pursuits, which may impact on an individual's proxy SES.

Conclusions

The identification and investigation of the five disparate cannabis user types reported in the last three chapters indicates that cannabis users are not a single homogeneous group. In the present chapter, the cannabis user types were found to differ in relation to their levels of psychopathology and cognitive functioning, and thus, levels of everyday functioning. Overall, 46% of Avid Users, 29% of State Changers, 20% of Self-Medicators, 17% of Fun Seekers, and 16% of Social Users were identified as being likely to experience impaired everyday functioning, while 33% of the non-cannabis using participants were similarly affected. The vast majority of this impairment was related to psychopathology; however, comorbid cannabis dependence was implicated in between 11% and 45% of the impairment experienced by the cannabis users groups.

These findings indicate that an individual's motives for using cannabis and the context of such use can be used as indicators of everyday functioning. It is important to note that this is not a causal relationship, rather the reasons why a person chooses to use cannabis (which may lead to them finding an appropriate context, or stem from them being in a context where cannabis is available) provides insight into their current and childhood lifestyles. This and related issues will be discussed in the General Discussion.

CHAPTER 14

GENERAL DISCUSSION

Study Aims & Objectives

Aims

This investigation was designed to provide greater insight into the nature of both cannabis use and cannabis users in the general population, and increase understanding of why some individuals experience adverse use-related issues but not others. Therefore, the overall aim of the study was to differentiate 'problematic' and 'non-problematic' patterns of cannabis use in relation to the level of impairment experienced by cannabis users in their ability to function in everyday life, and to facilitate the identification of individuals at increased risk of experiencing such impairment.

Objectives

The first objective of this investigation was to describe the hidden population of cannabis users evident in the general population. It was hypothesised that there would be a large degree of heterogeneity evident in the participant sample in relation to their demographic profile and current and childhood lifestyles. This hypothesis was supported.

The second objective of this investigation was to increase knowledge about, and understanding of, the nature of cannabis use in the general population. It was hypothesised that there would be a large degree of heterogeneity evident in the participant sample in relation to their patterns of cannabis use. It was also hypothesised that childhood and current lifestyle factors would be associated with patterns of cannabis use, motives for use, and subjective experiences of use. These hypotheses were supported.

The third objective was to investigate: a) the nature of the association between cannabis use and previously reported adverse use-related issues; b) the likelihood of users experiencing these use-related issues; c) the severity with which they are experienced; and, d) the 'real word' impact of adverse use-related issues on the ability of users to function in daily life. The use-related issues of interest in the present study were current levels of psychopathology and cognitive functioning. It was hypothesised that patterns of cannabis use would be significantly associated with levels of psychopathology and cognitive functioning. Although this hypothesis was supported by the odds ratio analyses and initial multiple regression analyses, the associations were typically not significant once other factors were taken into account.

The fourth objective of this investigation was the development of a cannabis user typology, with an initial basis in motives for cannabis use and the physical and social contexts of such use. It was hypothesised that the user types identified through the typology would differ in relation to their patterns of cannabis use, demographic profiles, current and childhood lifestyle factors, and their levels of everyday psychopathological and cognitive functioning. This hypothesis was supported.

Findings and Implications

Contribution to Current Knowledge

As noted in Chapter 1, the literature contains a number of methodological shortcomings that have contributed to the difficulty in determining the actual harms and problems associated with cannabis use, and in identifying individuals at risk of experiencing these adverse outcomes and/or use-related issues. Six overarching limitations were identified in the literature. These are discussed below in relation to the present study.

The validity of dependence criteria and diagnoses of cannabis use disorders, and the tendency of researchers to employ dependence as a proxy for problematic or harmful use.

There is increasing recognition that the usual methods of assessing cannabis dependency, such as DSM and ICD criteria, may not be valid due to the nature of requisite criteria (e.g., Dunlap, Benoit, Sifaneck, & Johnson, 2006). Of particular concern is that participants in past research have been found to meet criteria for a diagnosis of dependence even though they have used cannabis less than monthly (Chen, Kandel, & Davies, 1997) or only once or twice in their lifetime (Chen & Anthony, 2003). To avoid a similar situation, dependence was only assessed in current daily cannabis users in the present study. Interestingly, it was apparent that the dichotomous dependent/non-dependent classification of participants was not as strongly associated with other variables as the actual number of proxy dependence criteria endorsed by the participants. This indicates that, while the classification of individuals into dependent or non-dependent categories may be useful in treatment settings, the gradations are more important than the defined cut-point when using the dependence criteria for research purposes.

While problematic use is referred to in the literature, there is no agreed definition and neither ICD-10 nor DSM-IV-TR has a corresponding diagnostic category. In the present study, problematic use was defined as patterns of cannabis use that were associated with impairment in an individual's ability to function in day-to-day life, with a specific focus on psychopathology and cognitive functioning. Overall, half of the dependent users encountered some level of impairment in comparison to a quarter of non-dependent participants. However, the relationship varied across the user types, with 59% of dependent Avid Users and 51% of dependent State Changers experiencing impairment in their everyday functioning, in comparison to 43% of dependent Fun Seekers, 36% of dependent Self-Medicators, and 30% of dependent Social Users. Impairment in everyday functioning was also experienced by 39% of non-dependent Avid Users, 24% of non-dependent State

Changers, 17% of non-dependent Self-Medicators, 16% of non-dependent Fun Seekers, and 15% of non-dependent Social Users. Thus, it is evident that cannabis dependence does not equate to problematic cannabis use in the present sample.

Further, the majority of impairment in everyday functioning experienced by the participants was related to depression symptomology, which was not found to be directly associated with cannabis dependence. Thus, although co-morbid dependence was implicated in the impairment experienced by some of the participants (45% of impairment encountered by Avid Users, 32% by State Changers, 20% by Self-Medicators, 16% by Fun Seekers, and 11% by Social Users), the majority of the impairment evident in the present sample could not actually be considered cannabis use-related harm. Overall, these findings support previous suggestions that a diagnosis of cannabis dependence does not necessarily equate to problematic use of the substance, nor indicate the impact that cannabis use has an on individual's ability to function in their day-to-day life (Alexander, 2003; Swift, Copeland, & Hall, 1998; Swift, Hall, Didcott, & Reilly, 1998).

The assumption that more frequent use equates with more harmful or problematic patterns of use, and that frequency of use is an acceptable proxy for dose, with little or no consideration given to the quantity or quality (potency) of cannabis consumed.

While many researchers have employed frequency of cannabis use as a proxy measure of harmful or problematic patterns of use, or as a substitute for the measurement of dosage, a few researchers have found that it is the quantity of cannabis used rather than the frequency with which it is used that is most strongly associated with cannabis use disorders (Grant & Pickering, 1998; Swift, Hall, Didcott et al., 1998). Supporting the latter finding, in the present study the quantity of cones/joints consumed per week was more strongly associated with the number of proxy cannabis dependence criteria endorsed by the participants than their frequency of use. Yet, none of these variables (frequency of use,

quantity use, or dependence) were found to be directly associated with impairment in everyday functioning.

Further, even though cannabis dose was calculated as thoroughly as possible in the present study (i.e., without being able to physically test the cannabis used), with cannabis potency, ratio of cannabis to tobacco, and the number of cones/joints consumed taken into account, this variables was not found to be directly associated with impairment in everyday functioning. Thus, the present study findings indicate that, while frequency of use and the quantity and quality of cannabis consumed are associated with cannabis dependence, they are not directly associated with impairment in everyday functioning.

The lack of investigation into other potentially important facets of cannabis use (e.g., motives for use, context of use, subjective experiences of intoxication) and the roles they may play in adverse outcomes and/or use-related issues.

This situation, where studies typically focus on just one of two aspects of use (e.g., frequency of use, dependence, or early onset), has resulted in a lack of detailed knowledge about many facets of cannabis use, and specifically, a lack of understanding about overall patterns of use. To address this issue, the questionnaire for the present study contained in-depth exploration of cannabis use factors, but was not primarily a descriptive study (e.g., Reilly, Didcott, Swift, & Hall, 1998; Swift, Hall, & Copeland, 1998). The level of information gathered through this investigation enabled the examination of many aspects of cannabis use not typically undertaken by other researchers. For example, as noted above, unlike other studies, which often employ frequency of use as a proxy measure of dose, in the present study cannabis dose was calculated as thoroughly as possible, with this usage data supplemented by information relating to frequency of use, normal and highest levels of intoxication typically experienced by the participants, and the concurrent use of alcohol, tobacco, and other substances.

Notably, in the present study, motives for use, physical and social contexts of use, levels of intoxication and subjective experiences of cannabis use were identified as being important factors for understanding the differences between cannabis users, particularly in relation to their everyday functioning. Specifically, in the present study, the reasons an individual uses cannabis and the context in which they use it were found to be more important factors for understanding adverse use-related issues than the frequency, quantity, or dose consumed by users, or their dependence status

Further, the development of detailed cannabis user typology enabled a change of approach from primarily focusing on the assessment of the effects of individual variables in relative isolation, to assessment of the participants' patterns of responses over a large number of variables. This approach embraced the heterogeneity of cannabis users and cannabis use, acknowledging that different subgroups of users are likely to have different experiences and outcomes of use and providing the basis for a holistic understanding of cannabis users, their patterns of use, and their everyday functioning.

The methodological differences between studies (e.g., sample populations, participant classification systems, variables assessed, outcome measures employed), the lack of statistical control for potential confounds (e.g., other substance use, pre-existing psychopathology), and the tendency for authors to focus on significance levels without consideration of effect sizes.

The methodological differences evident in the literature are quite substantial, for example, they preclude researchers from completing valid meta-analyses exploring the relationships between cannabis use and psychological disorders (Macleod et al., 2004). In some ways the present study contributes to this situation, by not appropriating a previously defined classification system for the variables assessed in the study. However, all variables were preferentially continuous and, if categorical, the range of responses was maintained to a large extent through the utilisation of many narrow response categories. In a further effort to

avoid compounding the issues associated with the methodological differences in the literature, comparative data was provided where possible, such that the participants' lifestyle data was compared to general population data and that from both treatment-seeking and community samples of cannabis users, while both clinical and general population data was provided in relation to psychopathology and cognitive function variables. Thus, allowing appropriate comparisons to be made between these populations and the study participants.

Additionally, by assessing many cannabis use factors, participants were not classified solely on the basis of any one factor, thus reducing the possibility of inappropriate classification and the resultant effects of this on study findings. It is important to note that the heterogeneity of both cannabis users and their patterns of cannabis use evident in the present study indicate that it is inappropriate to classify participants solely on the basis of the frequency with which they use cannabis, as has been done by many researchers. This heterogeneity was identified through the extensive questioning in relation to the participants' cannabis use, and current and childhood lifestyles. Thus, although cross-sectional in design, the study did not focus on only one phase of life. This approach allowed the participants' use of cannabis to be placed within the context of their life, providing greater insight into the nature of cannabis use within this population of non-treatment-seeking users and increasing understanding of the cannabis users in question.

This approach also enabled the holistic assessment of life circumstances and behaviours and their associations with cannabis use and adverse use-related issues, thereby alleviating much potential for confounding. Confounding has been identified as a major issue in the literature, with Degenhardt, Hall, and Lynskey (2001), Macleod et al. (2004) and Moore et al. (2007) reporting that that the strength of the associations between cannabis use and psychopathology were reduced, and sometimes fully attenuated, after adjustment for potential confounds, such as demographics, neuroticism, and other drug use. These findings are supported by the present study, where cannabis use factors were not found to be

associated with psychopathology variables after other factors were taken into account. Moreover, Degenhardt et al. (2003) and Macleod et al. (2004) suggest that previously reported relationships between depression and cannabis use may have been due to common risk factors, which were either overlooked or not controlled for appropriately in past studies. This is important because both substance use and psychopathology share common antecedents, such as childhood adversity. The present study supports this premise, suggesting that, rather than cannabis use causing later psychopathology, cannabis use and psychopathology may both be outcomes of adverse life circumstances.

Studies investigating the outcomes of cannabis use typically focus on either psychopathology or cognitive function, but not both. Results from the present study suggest that this dichotomy within the literature may have contributed to the confounding of studies assessing cognitive functioning in cannabis users, through the lack of consideration of the effects of psychopathology. This is a major issue because impaired cognitive functioning is typically evident in people experiencing psychotic symptoms/disorders (e.g., schizotypy, schizophrenia, psychosis) and also in people with mood disorders (Kraus & Keefe, 2007; Spitznagel & Suhr, 2004). In the present study, psychopathology (particularly depressive and positive psychotic symptomology) was the primary factor associated with memory problems, while also being associated with distractibility.

The potential bias resulting from researchers having limited access to non-treatment-seeking or treatment-referred drug-using populations.

As noted in Chapter 1, cannabis use studies typically follow one of two designs: light users vs. heavy users or non-users vs. users, with the former studies generally recruiting treatment-seeking users, and the latter studies tending to involve the recruitment of university students, or being based on a subset of items from large general population household or school-based surveys. These sampling procedures may explain the evident bias

of some researchers in seemingly viewing all cannabis use as problematic. For example, the clinical populations that the researchers typically come into contact with are most likely to be experiencing cannabis use-related problems, otherwise they would be unlikely to present to clinical settings. Additionally, Denson and Earleywine (2006) have noted that individuals who have never used cannabis differ from those who have in numerous ways beyond just their use or non-use. These differences are particularly apparent for younger cohorts, where not using cannabis may be considered almost an abnormal behaviour due to the normalisation of use evident in countries such as Australia, the USA and UK (Miller & Plant, 2002; Parker, 2005).

These sampling procedures are likely to have impacted on what is currently known about cannabis use, such that there are relatively few studies focusing solely on non-treatment-seeking users, resulting in a lack of knowledge relating to cannabis use in the general population. It is apparent in the literature that differences exist between research based on treatment-seeking users and the studies that assess users in the general population, with these differences indicating the existence of a large hidden population of cannabis users who do not experience difficulties of a magnitude which would lead them to seek treatment for their cannabis use (Degenhardt, Lynskey, Coffey, & Patton, 2002; Looby & Earleywine, 2007; Teesson et al., 2000). The present study recruited participants from this hidden population, with participants found to differ from both general population and treatment-seeking samples in relation to a number of lifestyle factors that have been reported in the literature as risk factors for cannabis use or dependence, while being similar to other samples of non-treatment seeking users. Importantly, the results of the present study indicate that there is no such thing as a 'typical' cannabis user.

The lack of translation of findings regarding adverse use-related issues into meaningful discussions clarifying the 'real world' consequences in terms of an individual's ability to function in everyday life.

While the cannabis literature contains many reports of differences between cannabis users and non-users or between light and heavy users, the authors rarely provide information about how (or if) these differences are meaningful outside of the research setting. That is, researchers typically ignore the possibility that the statistically significant differences found between study groups may not actually translate into 'real world' differences in the participants' ability to function in everyday life. Moreover, the determination of the likelihood of users experiencing adverse use-related issues, the severity with which they are experienced, and the translation of this information into estimates of impairment in everyday functioning is particularly important so that the true impact of cannabis use can be ascertained. These issues were addressed in the present study in relation to psychopathology and cognitive function, with estimates made regarding the levels of impairment in everyday functioning experienced by the participants.

Key Findings and Implications

Cannabis Users

A large level of heterogeneity was evident in the demographic data and the current and childhood lifestyles of the participants in the present study, but overall the participants were generally similar to other non-treatment-seeking samples of cannabis users with regard to these factors. As a group, study participants differed from the general population in relation to a number of the previously reported risk factors for cannabis use, but were less affected than treatment-seeking substance users. Taken together, the findings suggest that some of the participants could have been identified according to standard risk factors for cannabis use, but many did not fit the profile. Rather, the diversity apparent in this hidden population attests to the fact that there is no 'typical' cannabis user.

Cannabis Use

A high level of diversity was evident in the participants' patterns of cannabis use and use-related behaviours, but overall the participants used cannabis similarly to non-treatment-seeking cannabis users surveyed by other researchers, and were moderate users in relation to treatment-seeking samples. Importantly, the findings suggest that an individual's externalising response to adverse life events and/or circumstances may be a key factor in linking early cannabis use to potentially problematic patterns of cannabis use. Moreover, daily cannabis use was a normalised activity for many of the participants, and tended to be just one aspect of their social activities. However, participants who used cannabis alone were more likely to meet proxy cannabis dependence criteria.

Motives & Experiences

The associations between motives for cannabis use and subjective experiences of use tend to suggest support for the mood-amplifying effects of cannabis. The study findings also appear to confirm the dose-dependent nature of subjective experiences of use, with levels of intoxication associated strongly with all subjective experience subscales. Additionally, it is possible that tolerance to the effects of cannabinoids is important, with those participants who had longer histories of cannabis use being less likely to experience subjective effects of use; however, the latter could also be related to the lower levels of intoxication reported by the older participants.

The vast majority of participants reported using cannabis because they enjoyed it, and stated that it made them feel happy. Negative experiences of use (i.e., psychopathological experiences: anxiety, depression, paranoia, suicidality) were rare in the study population, and were most likely to be encountered by participants who were using cannabis because they felt pressured to use or because they felt they needed to use it (e.g., to avoid withdrawal symptoms, to feel normal or fit in), rather than because they wanted to use (e.g., used to relax

or because they enjoy using). These findings suggest that cannabis use is problematic for the few individuals reporting psychopathological experiences of use. In contrast, participants reporting perceptual changes (assessed with the altered reality subscale) and enhanced experiences (e.g., feeling happy, excited, uninhibited, laughing and talking more than normal), who were primarily using cannabis socially, do not appear to experience adverse acute effects of cannabis use. Further, the participants' differing life circumstances and patterns of cannabis use were associated with different motives for cannabis use and different subjective experiences of such use.

Cannabis Use-Related Issues & Everyday Functioning

There are five potential types of relationship between cannabis use and psychopathology. The results from the present study do not support a direct causal relationship (whereby cannabis use causes the development of psychological disorders) or an indirect causal relationship (where cannabis use has an impact on another variable, which then leads to psychopathology). However there is support for there being no causal relationship, with risk factors common to both cannabis use and current psychopathology causing both disorders independently (specifically, childhood psychopathology), and there was clear evidence of self-medication (with individuals experiencing psychological disorders using cannabis to 'treat' their symptoms or side-effects). Although, with more than 50% of the variance in psychopathological variable scores unexplained, there are clearly other important factors that were not assessed in the present study. It is likely that at least some of this variance would be explained by genetic factors (Caspi et al., 2005), thus providing room for a predisposition/vulnerability hypothesis, which proposes that cannabis use triggers psychological disorders in individuals with an underlying vulnerability or predisposition for that disorder.

For the most part, levels of cognitive functioning were explained by comorbid psychopathology. These findings suggest that the differences in cognitive functioning found by previous researchers may have been confounded by not taking psychopathology into account. Further, susceptibility to physiological acute effects of cannabis use, whether due to high levels of intoxication or some other mechanism, was found to be linked to higher levels of impairment in everyday cognitive functioning. These physiological effects of cannabis use (e.g., bloodshot eyes, dry mouth/throat, the 'munchies') were associated with high sessional doses of cannabis (levels of intoxication), and may therefore be indicative of a critical level of consumption. That is, individuals who use enough cannabis to get highly intoxicated, and experience these physiological effects of use, may also be using enough cannabis to lead to impaired cognitive functioning. Hence, the physiological effects of acute use may be an indicator of the neuropsychological impact of cannabis use. However, with between 58% and 71% of the variance in everyday cognitive functioning variable scores unexplained, there are clearly other important factors that were not assessed in the present study. For example, it is likely that at least some of this variance would be explained by the participants' innate levels of cognitive ability/intelligence (Pope et al., 2003).

Overall, 28% of participants were likely to have experienced some level of impairment in relation to their ability to fulfill their usual daily activities and meet their responsibilities. The majority of this impairment was related to current depression. Further, the study findings suggest that, while cannabis use is not problematic for the vast majority of participants in the study population, it may exacerbate the psychopathological symptomology of participants with current and pre-existing mental health issues (i.e., those experienced during childhood/adolescence).

Cannabis User Types

Five cannabis user types were identified in the present study, indicating that cannabis users are not a homogenous group, rather it is possible to identify subgroups of users who use cannabis for different reasons and in different contexts. These subgroups were found to differ demographically and in relation to their current and childhood circumstances, and to engage in different patterns of use and experience different effects of use. Moreover, the cannabis user types were found to differ in relation to their levels of psychopathology and cognitive functioning, and thus, levels of everyday functioning. Overall, 46% of Avid Users, 29% of State Changers, 20% of Self-Medicators, 17% of Fun Seekers, and 16% of Social Users were identified as being likely to experience impaired everyday functioning. The vast majority of this impairment was related to psychopathology; however, comorbid cannabis dependence was implicated in 11% of the impairment experienced by Social Users, 16% of that experienced by Fun Seekers, 20% of Self-Medicators' impairment, 32% of the impairment experienced by State Changers, and 45% of the impairment experienced by Avid Users.

Thus, the results from the present study suggest that an individual's motives for using cannabis and the context of such use can be used as indicators of everyday functioning. However, it is important to note that this is not a causal relationship. Rather the reasons why a person chooses to use cannabis (which may lead to them finding an appropriate context, or stem from them being in a context where cannabis is available) may provide insight into their patterns of cannabis use, the subjective effects of such use, and current and childhood lifestyles, which in turn, may provide an indication as to their ability to function in day-to-day life.

Limitations

Generalisability of the Study Findings

The generalisability of the study findings are affected by a number of factors:

1. Only individuals with Internet access were able to participate in the study.
2. The utilisation of cannabis use-related Internet sites for the majority of the recruitment campaign may have biased the sample. For example, it is possible that these individuals differ from other non-treatment-seeking users in that they may have a higher level of commitment to the cannabis-using culture, and may be more likely to view their cannabis use as an important part of their own identity.
3. The non-users recruited to the study, and employed as a nominal control group, were also perhaps different in some way from other people who do not use cannabis.
4. It is probable that the individuals who did not complete the survey, or chose not to participate at all, were different from those that did. For example, people who were more severely affected by mental health issues or cognitive difficulties may have been more likely to dropout or not commence the questionnaire than less affected individuals.

Self-selection bias is unavoidable in studies recruiting voluntary participants, but may have been minimized in the present study if the questionnaire had been shorter and ordered differently and if the recruitment methods had a broader focus and had been more specific regarding the nature of the study. Nevertheless, the population targeted for recruitment (i.e., 20-29 year olds in English speaking countries) was identified as being likely to have access to the Internet. Further, the broad age range evident in the sample, and the diversity apparent in relation to demographic data, suggest that a broadly representative sample of the general population was involved in the present study. Moreover, the cannabis users participating in

the present study were found to be similar to other non-treatment-seeking samples recruited offline.

Data Quality

It is possible that the quality of the study data was also affected by methodological issues. For example, the recruitment of participants through online cannabis-using communities may have affected the validity of the data. That is, it is feasible that individuals endeavoring to build connections and gain a sense of belonging within the community may adopt a pattern of understating or discounting negative aspects of cannabis use, while overstating positive aspects. Additionally, while the sample consisted of participants from many different nations and cultures, these differences were not investigated. It is therefore possible that national and/or cultural differences may have had a confounding effect on the study findings.

Data quality may also have been affected by recall bias, particularly in relation to participants' reports of their childhoods. As noted in Chapter 4, this would most likely have led to the participants under-reporting events and behaviours typically viewed as being socially undesirable (Hassan, 2006). However, this is potentially attenuated (at least partially) by the increased honesty garnered from participants involved in internet-based studies (Wang et al., 2005). Further, the data collected from present sample indicated a large amount of variation in relation to adverse life circumstances and aspects of everyday functioning. The fact that this data was similar to that reported for other non-treatment samples of cannabis users, lower than reported for treatment sample, and higher than reported for non-cannabis using samples, provides some support for the accuracy of the data reported by the participants.

Conclusions

Taken as a whole, these findings suggest that there is no 'typical' cannabis user. Therefore, cannabis use-related public health and education campaigns need to be more broadly targeted, or tailored, rather than solely focusing on teenagers and young adults. Further, although most participants were 'heavy' users and nearly half were daily users, the vast majority did not experience any adverse effects of cannabis use. Hence, cannabis use had no apparent negative impact on the lives of most users assessed in the present study. Moreover, for affected participants, only a small amount of impairment in everyday functioning was found to be associated with their cannabis use. This information is important in light of the current debate over the legal status of cannabis, and the ongoing discussion regarding how much of a social and health problem cannabis represents, in countries such as Australia, the UK, and the USA.

It is important that public health and education campaigns are as accurate as possible regarding the negative effects of cannabis use and the likelihood of individuals experiencing these issues. These campaigns and associated health services should more appropriately target individuals who are most likely to encounter impairment in their everyday life. Cannabis use-related preventative and early intervention strategies also need to be more appropriately targeted. For example, early use needs to be viewed within the context of other externalising behaviours, and viewed as a possible symptom of underlying problems. Thus, preventative strategies might be best targeted at improving the home environments of those who are beginning to exhibit delinquent behaviours (e.g., being truant from school), such as by treating parents with addictions, improving supportive networks within the family, and/or providing adult support outside of the family. Moreover, the provision of psychological treatment to aid recovery from trauma and other adverse life circumstances might also prevent, or aid in the treatment of, substance use disorders.

Finally, these findings suggest the need for a paradigm shift, with cannabis use viewed within a more holistic context and as a symptom or indicator of adverse life circumstances, rather than as an independent negative behaviour that is responsible for a range of health and behavioural problems. Thus, the complexity of interactions between individual behaviours and life circumstances needs to be acknowledged in treatment settings, with holistic or multidisciplinary treatment approaches employed. Ideally, a holistic dual-diagnosis service model would be developed, focusing on both psychological and physical health (e.g. depression, sleep disorders, post traumatic experiences, and substance use). In the interim, alcohol and other drug services and mental health services must be linked to prevent individuals from falling through the cracks, in terms of service provision. Moreover, treatment services would ideally implement individually tailored cognitive-behavioural treatment programs based on reasons for cannabis use and the context of such use, and also taking into account the role cannabis has played in a user's life. Therefore, there is need for further research to develop and validate an appropriate screening tool and treatment system for clinical use. Further research is warranted into associations between cognitive functioning and the physiological acute effects of cannabis use, and the neuropsychopharmacological effects of the conjoint administration of nicotine and cannabis.

To summarise, the majority of impairment in everyday functioning evident in this sample was related to current psychopathology, which was not found to be directly associated with cannabis use. Affected individuals were more likely than non-affected users to have a history of adverse life circumstances, externalising behaviours, and pre-existing mental health issues. They were also more likely to experience psychopathological and physiological subjective effects of use. Thus, cannabis use may exacerbate pre-existing conditions, but does not appear to be associated with impaired everyday functioning for the vast majority of users.

Five different subgroups of cannabis users were identified. Social Users and Fun Seekers were unlikely to have encountered any impairment in the ability to function in everyday life. In contrast, Avid Users and State Changers were the most likely to have experienced some level of impairment, suggesting that these individuals might benefit from psychological treatment in relation these functional problems. Treatment of underlying issues stemming from childhood might also be advisable for Avid Users, State Changers, and Self-Medicators, along with harm-minimisation advice regarding adverse acute effects of cannabis use.

The information gained through this study will aid in the development of appropriately targeted and holistic, preventative, early intervention, harm minimization, and treatment strategies and services for current and potential cannabis users. Ideally, this information would be also incorporated into cannabis-related governmental policies, strategies, and legislation.

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