CHAPTER 1

GENERAL INTRODUCTION

Let us consider the following scenario:

> [A woman] was sitting in the front passenger seat of a car driven by a friend…Suddenly, she saw from her left a car traveling erratically down the steep road toward them. As the car lost control and hurtled over an embankment toward their car, she began to perceive events as occurring in slow motion, and then realized that she was looking down on the scene from above the car, in which she could still see herself sitting next to the driver. The oncoming car then descended through the air, landed on the hood of their car, bounced off, and landed on its top ten feet from their car. During this shocking event, [she] remained calm and detached. She then found herself "back in her body," unhurt and apparently unshaken. She calmly exited the car and went to check on the driver's son, who had climbed out of the car before the impact… She then checked the driver of the other car, and went into the house to call the police and ambulance. All of this was done in apparent complete emotional control, although later she would report that she did it all in a state of "automatic pilot." (Scaer, 2001, pp. 98-99)

No-one could deny that this incident would most certainly be considered traumatising to most individuals. Even so, one may question what it is specifically about this incident that it is considered traumatic even though instinctively (and rationally) we know it is. The reason, as illustrated by Classen, Koopman, and Spiegel (1993, p. 179), is that the above represents an "…abrupt physical disruption in ordinary daily experience…." The individuals in the car have probably driven that particular stretch of road on many occasions, but on this specific day something unusual occurs. But what is also striking in the above narrative is the reaction of the female passenger. She did not seem to be aware, at the time that it took the other car to careen down the hill and ricochet off the car in which she was a passenger, that this incident would be classed as a traumatic event, given her immediate reaction. She does not immediately react in the way that we presuppose individuals involved in distressing events *should* react. In the above scenario, the unnamed female seemed to go through this potentially catastrophic episode unscathed, both physically and emotionally. She remained "calm and detached" and felt as though she was going through the motions of what needed to be done (calling the police and an

ambulance) as though on "automatic pilot." She did not panic or freeze. While she was effectively detached from the situation, she also seemed to be emotionally numb, remaining calm and in complete "emotional control." The above brief anecdote provides an excellent example of *dissociation*, a form of self-regulation which occurred in response to this traumatic event. How individuals respond to traumatic events and other aversive and distressing episodes in their life is dependent on many factors, not the least of which includes the aspects of personality bearing on their capacity for self-regulation that they bring into the traumatic situation. As Regehr, Hill, and Glancy (2000) make clear: "…increased understanding of individual predictors can contribute to the development of intervention strategies and programs that are sensitive to individual differences in trauma response" (p. 334).

This thesis sets out to explore the potential role of individual differences in the personality traits of absorption and fantasy proneness, and dissociative experiences elicited by a hypnosis-like process in regulating affective responses to witnessing traumatic events, questions of great relevance for both researchers and clinicians concerned with trauma. Absorption, fantasy proneness, and hypnosis all involve the ability to set aside aspects of external reality and to become engaged in various self-forgetful experiences. This set of common processes is defined here by the term "trance." Thus any standard procedure designed to evoke these processes (such as a hypnotic induction or a state-of absorption induction) will be referred to in this thesis by the term "trance induction." The effects of such an induction procedure (which aims to elicit a more widely occurring process) will always be subject to relevant ability or trait factors and specific personal and contextual variables. It is often argued that in certain contexts these processes are also engaged for the defensive function of dissociating conscious awareness from distressing, painful, or self-threatening events. How they influence emotional responses to witnessing traumatic events will provide a basis for understanding how they may protect or undermine (some) individuals undergoing real traumatic experiences.

The hope of this thesis is that a better understanding of how these individual differences contribute to the regulation of affective experience will provide a useful model for the further exploration of dissociative processes in response to trauma. Literature will be examined in order to gain a clearer understanding of the psychological components of dissociative responses to traumatic stress. The ultimate aim of understanding dissociative responses to trauma is to guide clinicians to better tailor individual treatment programs taking account of these differences in

individual responses. Initially, two studies will examine the patterns of experience which emerge when the requirements of the situation engage individuals' capacities for involvement with inner-generated imaginings and the roles played by the abilities (traits) of absorption and imaging vividness in shaping those experiences. In particular, this thesis seeks to define those situations, abilities, and patterns of experience which may be said to correspond to the psychological process described by the term *dissociation*. Building on these findings, the third study will examine the relationship of these factors to key aspects of the emotional response evoked by witnessing scenes of traumatic events under laboratory conditions. The subjective experience of distress, skin conductance response, and the regulation of heart rate variability will each be examined as distinct components of the emotional response. The fourth study will then extend this examination using the electroencephalogram (EEG) in conjunction with a sophisticated signal analysis approach, Partial Least Squares (PLS; McIntosh & Lobaugh, 2004) to identify the activity of distinct neural processes underlying these relationships. Finally, the actual relationship of two distinct sources of traumatic experience, recalled childhood abuse and adult occupational exposure to these processes are directly examined in Studies 3 and 4. This program of research will aim to broaden our understanding of how and why some individuals engage dissociative responses, for either better or worse, when the experience of daily life is unexpectedly and uncontrollably shattered by trauma.

1.1 Chapter Overviews

Thus the aims and the corresponding objectives of each of the chapters are as follows:

- Chapter 2: Presents a review of the literature relevant to the present program of dissociation and trauma research and to the self-regulation strategies employed when responding to trauma. In particular, the chapter examines the concepts of detachment and compartmentalisation as distinct components of dissociative experience. The chapter discusses the potential roles of absorption (both as a state and a trait), fantasy proneness, and hypnosis in responses to trauma. The problematic nature of the definition of "trauma" itself is also discussed. The literature of psychosomatic self-regulation is examined, as is work linked to hypnotic analgesia and emotional numbing. The chapter closes with a methodological discussion of how the effects of trauma on cognitive and affective self-regulation can be studied, as well as the clinical implications of this field of research.

- Chapter 3: The first study in this thesis addresses the phenomenology of dissociative experience against the background and history of the measurement of alterations in experience in the context of hypnosis and similar trance induction procedures. As such, this study presents an exploratory factor analysis conducted on the dimensions of the Phenomenology of Consciousness Inventory (PCI; Pekala, 1991a) with the aim of uncovering the structure of experience whilst participants listen cooperatively to a hypnosis-like procedure designed to induce a state of absorption in inner-generated imaginings (Jamieson, 2007). This study sought to test Tellegen's (1981) model of absorption as a trait relating to two distinct modes of mental organisation, known as the experiential and instrumental mental sets, in the context of describing the dissociations in experience evoked by the "trance induction" procedure.
- Chapter 4: The second study explores the contribution of two important traits (i.e., absorption ability and imagery ability) in the dissociations of experience occasioned by the trance induction procedure. In Study 1, the key dimensions of the trance induction experience were described by a five-factor PCI solution. These five dimensions identify the parameters of individual differences in experience in response to trance induction instructions. Two of these factors, Altered Awareness and Self-Control, were identified in Study 1 as closely corresponding to Tellegen's (1981) description of experiential and instrumental mental sets. The PCI is employed in this study to examine the roles of both absorption ability (as measured by the Modified Tellegen Absorption Scale; Jamieson, 2005) and imaging vividness (as measured by Betts' Questionnaire Upon Mental Imagery; Sheehan, 1967) in the construction of these key dimensions of dissociative experience in the trance condition. The unique relationship of each of the five PCI factors with these traits is also examined with the expectation that Altered Awareness will uniquely predict Tellegen's experiential mental set and Self-Control will uniquely predict the instrumental mental set.
- Chapter 5: The principal aim of the third study in this thesis is to investigate the associations between emotional self-regulation in response to traumatic images and the state and trait expressions of experiential and instrumental sets (considered also to be key components of dissociative experiences). Furthermore, the relationship of differing types of recalled childhood abuse to these dissociation-like processes is examined in this adult sample. These childhood recollections are known to be related to an individual's ability

to use absorption, fantasy, and imagery in adulthood as shown in the literature (e.g., Lynn & Rhue, 1988; Rhue & Lynn, 1987; Wilson & Barber, 1983a, 1983b), although the nature of that relationship is a matter of dispute (Merckelbach & Muris, 2001; Näring & Nijenhuis, 2005). In this study, participants are exposed to a selection of traumatic images eliciting negative affective responses in two conditions: baseline and following trance induction. Whilst viewing these images their psychophysiological responses, in the form of skin conductance and heart rate, are recorded. In the first condition (i.e., the baseline), participants simply view the images and make ratings on how distressing they find each of them. In the second condition (i.e., the post-trance induction condition), individuals listen to the same hypnosis-like induction audio that was presented to participants in Studies 1 and 2 and then view a similar series of distressing images and again rate the degree of experienced negative affect. The differing relationship of subsequent experiential and instrumental experience to the pre- and post-trance induction expressions of the emotional response to negative affective images is examined together with their relationships to differing patterns of recalled childhood abuse.

- Chapter 6: In this final experimental chapter, the impact of adult exposure to traumatic events on the operation of these dissociation-like processes in the modulation (hence, self-regulation) of responses to viewing traumatic images is examined. Negative affective images are presented to two groups of participants (i.e., general population and occupational trauma exposed) in the two conditions (i.e., baseline and trance induction) utilised in Study 3. Analysis of autonomic responses (i.e., skin conductance and heart rate variability) and average subjective intensity ratings of the images is conducted in order to examine potential differences in responding between the two groups in the two conditions. Additionally, an examination of the neural networks underlying pre-post trance induction differences in responses to negative images between the two groups is pursued by applying the recent extension of PLS to the analysis of neurophysiological data sets.
- Chapter 7: In this the concluding chapter, the implications of the main outcomes of the thesis for our understanding of dissociations of experience in responses to trauma are discussed, clinical implications are drawn, and future research directions for this understanding are outlined.

The following Literature Review was published as:

Loi, N.M. & Jamieson, G.A. (2010-2011). The role of absorption, fantasy proneness, and hypnosis in response to trauma. *Australian Journal of Clinical and Experimental Hypnosis, 38*(2)/*39*(1), 98-120.

STATEMENT OF ORIGINALITY

We, the PhD candidate and the candidate's Principal Supervisor, certify that the following text, figures and diagrams are the candidate's original work.

Type of work	Page number/s
All, aside from contributions by the co-author listed on the following form.	

Name of Candidate: Natasha Loi

Name/title of Principal Supervisor: Dr Graham Jamieson

[redacted]

Candidate

01-07-2011

Date

[redacted]

Principal Supervisor

01-07-2011

Date

STATEMENT OF AUTHORS' CONTRIBUTION

We, the PhD candidate and the candidate's Principal Supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the candidate's contribution as indicated in the *Statement of Originality*.

	Author's Name (please print clearly)	**% of contribution**
Candidate	Natasha Loi	65
Other Authors	Dr Graham Jamieson	35

Name of Candidate: Natasha Loi

Name/title of Principal Supervisor: Dr Graham Jamieson

[redacted]

Candidate

01-07-2011

Date

[redacted]

Principal Supervisor

01-07-2011

Date

CHAPTER 3
STUDY 1

3.1 Introduction

The scientific investigation of the nature of consciousness has a somewhat chequered history. Until recently, many did not believe that it was either possible or relevant for neuroscientists to investigate such a topic. As contemporary philosopher of mind John Searle (2000, p. 558) states, "…consciousness seems too airy-fairy and touchy-feely to be a real scientific subject." But what then is consciousness, and why should it not be a relevant topic of investigation?

Consciousness, a somewhat elusive concept, may be defined in terms of "…inner, qualitative, subjective states and processes of sentience or awareness" (Searle, 2000, p. 559). It includes all the awareness that we as human beings have of our everyday waking lives. The philosopher Tim Bayne (2007a, 2007b), in his writings on consciousness, discusses the concept of what he refers to as phenomenal consciousness. Bayne claims that phenomenal consciousness can be thought of in two ways: in terms of phenomenal states or in terms of phenomenally conscious creatures. He describes a phenomenal state as "…a state that there is something like it is to *be in*" (italics added; Bayne, 2007b, p. 1). Each phenomenal state has an individual character. So in Bayne's (2007b) view, there is something it is like to do just about anything (e.g., to smell a flower, feel the sand of the beach under your feet, or hear your favourite song on the radio). A phenomenally conscious creature, on the other hand, is "…a creature that there is something it is like *to be*" (italics added; Bayne, 2007b, p. 1). Bayne (2007b, p. 2) claims that only phenomenally conscious creatures have a phenomenal "perspective." That is, the ability to subjectively experience events such as those listed previously. It is important to note, however, that phenomenally conscious creatures can experience different *types* of conscious states. For example, Ronald Shor in his seminal 1959 paper identified a dimension in the organisation of awareness that played a crucial role in differentiating between the hypnotic state and the usual state of waking consciousness which he labelled as the generalised reality-orientation (GRO). The normal state of consciousness is "…characterized by a structured frame of reference in the background of attention which supports, interprets, and gives meaning to all experiences" (Shor, 1959, p. 585). So in other words, when individuals orient toward an object of attention in this ordinary state, the GRO acts as the context or framework in which it is held. However, there are occasions when this reality-orientation "slip[s] away" (p. 588) and, as such, Shor (1959, p. 587) states the GRO "…cannot be

taken for granted as a *given*, but rather can temporarily disintegrate in special states of mind." These special states may include during hypnosis or, more typically, during states of trance or absorption. Thus during these states "reality-awareness" recedes. It is important to note, though, that this state does not need to occur under extraordinary or unusual circumstances. Indeed, Shor (1959) describes a situation in which he was greatly absorbed in a book he was reading when his wife spoke to him. While on some level of consciousness he was aware something had intruded into this absorbed state, the GRO needed to be reinstated in order for him to orient toward his wife and attend to what she was saying. It could be, however, that one state (the GRO) simply replaced the other state (absorption) or, alternatively, that the GRO had "…receded…into the background…far from the field of conscious awareness" (Shor, 1959, p. 593).

We as humans (i.e., phenomenally conscious creatures) are not restricted to experiencing states defined by only a single dimension of consciousness at any one moment in time. Rather, we are capable of experiencing a myriad of states of consciousness elements which are then integrated together to create a "total" phenomenal state (Bayne, 2007b). For instance, Bayne (2007b) speaks of us being, at any one time, capable of experiencing both a number of perceptual events in various sensory modalities in addition to different bodily sensations, affective experiences, and cognitive experiences. Bayne (2007a, 2007b) refers to this totality of phenomenal experience as the "unity of consciousness." As Bayne (2007a) states, all of our sensory experiences "…do not occur as phenomenal atoms but are unified in a single global field of consciousness; they are mutually phenomenally unified" (p. 94). It is the organisation of this unified conscious field that is identified by the term "state of consciousness."

Thus the experience of the various "contents of consciousness" is not a fragmentary process. This may be best illustrated using the following example. There is something it is like to see a tree, but looking at this tree is not the only thing that is occurring in that moment. There is also the experience of standing in front of the tree, the experience of perhaps hearing birds in the tree, the experience of feeling your feet on the ground, or any number of other experiences all linked together in that one single moment in time. We generally do not think of every isolated incident that makes up the broader picture; we are usually only aware of that unified totality (i.e., looking at the tree). However, the tree as an object of consciousness can be experienced in any number of frameworks for organising the structure and flow of conscious states including, but not limited to, ordinary waking, dreaming, and drug-induced hallucination.

Searle's (2000) definition includes two main components of consciousness that must be accounted for in any comprehensive explanation. The first is that all consciousness has a qualitative feel to it. Searle (2004, p. 134) provides the examples of feeling pain or tasting ice cream as two particular states that many people associate with consciousness. Everyone can imagine what these "feel" like. However, Searle also makes note of the fact that other states have a qualitative feel to them even if at first we do not consider them. The example he provides is thinking about the fact that two plus two equals four. He goes on to explain that if we do not think of this action as having any particular qualitative feel to it, he asks the reader to imagine what it feels like to think the same equation in German or French. The feeling is completely different.

The second main component of the above definition is that consciousness is subjective. That is, because consciousness is qualitative, it is implied that there is an agent who experiences the event (Searle, 2000). Also critical to Searle's definition is the fact that two people experiencing the same event (e.g., watching the same movie) will experience it in their own way. Thus consciousness is necessarily a first-person experience with this component corresponding to Bayne's notion of phenomenally conscious creatures.

3.1.1 Measuring Trance-Like Alterations in Consciousness

The question of what constitutes a state (and by extension an altered state) of consciousness is one that has occupied researchers for decades. As Ernest Hilgard (1969) remarked, it is not easy to provide a satisfactory definition of a state. Hilgard subsequently defined a waking state as one in which one is aware of (and thus able to report on) what is happening in the external environment. To be in a waking state is thus to have control over one's behaviour. This, however, is a purely functional definition which sidesteps the requirement for the phenomenological definition which is called for by Bayne's (2007b) account of a state as something it is like to be in. Kihlstrom (1985, p. 405) further proposed that the term "state" may in fact be "…construed only as a kind of shorthand, with no causal properties or defining features associated with it…" and if this is so, then the role of special states of consciousness (e.g., hypnosis) in explaining behaviour "…disappears as a substantive issue…." More recently, however, psychologists Kumar, Pekala, and Cummings (1996) have proposed a method to define and measure a state of consciousness as a discrete pattern of reported subjective experience. Thus for the purposes of the current study, the term *state* will refer to an identifiable pattern of phenomenological self-report.

An *altered state*, then, implies an alteration in the pattern of subjective experience. However, defining altered states has never been a simple process (for a review of the altered state debate, see Kirsch & Lynn, 1995). There are many different stances regarding this hypothesis. However, for the purposes of simplicity, an altered state is used here to describe the subjective changes an individual experiences under different circumstances, be it sleeping or as the result of a hypnotic induction, for instance. As Kirsch and Lynn (1995) claim, though, when researchers use the term "altered state" they are using a *descriptive* definition; they are not explaining how those changes have come about.

The notion of a "trance state" as a particular kind of alteration in the organisation of consciousness is one that has also been investigated extensively. Researchers have referred to trance states in numerous contexts, including natural and ordinary phenomena such as daydreaming, concentration on a task, and absorption in reverie (Kirsch & Lynn, 1995), in addition to experiences produced by an induction procedure (e.g., via hypnotic induction, relaxation tape, or religious ritual). Generally, what are described as trance states are accompanied by an alteration in the experience of conscious/volitional control. This is demonstrated by Shor (1979) who refers to trance as the temporary "elimination" of our normal everyday reality context from consciousness. This everyday reality is ever present in the background of our conscious experience, and as Shor (1979, p. 123) states, we tend to "…take it for granted."

The examination of trance-like subjective experiences in individuals under specific altered state inductions had previously been investigated by several researchers (e.g., Ås & Lauer, 1962; Shor, 1960; Tart, 1975). Shor (1960), for instance, developed the Personal Experience Inventory, a 44-item questionnaire which assessed the frequency of naturally occurring "hypnotic-like" experiences in everyday life. This questionnaire asked participants whether they had *ever* experienced anything like the following examples: "Have you ever tended to be lulled to sleep while you were driving your car on a quiet, level stretch of road?" and "Have you ever wandered off into your own thoughts while doing a routine task so that you actually forgot you were doing the task, and then found, a few minutes later, that you had completed it without even being aware that you were doing it?" (Shor, 1960). In a study examining the "commonness" of such experiences, Shor (1960) administered the questionnaire to two student populations: 80 Boston University engineering students (78 males, two females) and 65 Brandeis University liberal arts

students (primarily female). The results indicated that trance-like experiences as measured by the Personal Experience Inventory were indeed quite common in a college university population with 41 percent of engineering students indicating they had definitely experienced the event in question and 59 percent of liberal arts students indicating the same.

Following this research, Ås, O'Hara, and Munger (1962) developed the 60-item, dichotomous response (yes/no) Experience Inventory, an expanded version of Shor's (1960) Personal Experience Inventory. This measure, similar to Shor's (1960), examined experiences which Ås (1962) hypothesised to be related to hypnosis. In a study of 50 male college students, Ås (1962) administered this questionnaire in order to examine experiences occurring in non-hypnotic contexts which may be related to hypnotisability (measured using the Stanford Hypnotic Susceptibility Scale, Form A [SHSS:A], and the Consolidated Scale of Hypnotic Responsiveness). He found that there was a positive correlation between these non-hypnotic experiences and hypnotisability ($r = .35$ for the SHSS: A; $r = .47$ for the Consolidated scale). Thus the Experience Inventory appeared to be a valid measure of the subjective experience of hypnosis-related incidents.

Ås et al.'s (1962) Experience Inventory was then further modified by Lee-Teng in 1965. Lee-Teng's (1965) Hypnotic Characteristics Inventory was a 60-item questionnaire examining experiences and attitudes outside of the hypnotic environment. After conducting a factor analysis of the items, Lee-Teng (1965) interpreted five subscales which emerged from the data. These subscales included (with examples of questions illustrative of each): (a) Conformity (e.g., "In general, do you prefer to follow rather than to direct?"); (b) Trancelike Experiences (e.g., "When you dance, do you often feel that the music and mood are being expressed through your movements, while you yourself fade into the background?"); (c) Role-Playing (e.g., "While watching a movie or show do you sometimes become so involved that you feel yourself participating in the action?"); (d) Impulsivity (e.g., "When faced with a decision, do you usually ponder and weigh all aspects carefully?"); and (e) Concentration-Absorption (e.g., "Do you often have trouble in keeping your mind on what you should do?"; Lee-Teng, 1965).

While all of these inventories advanced the field of research into trance-like hypnosis-related experiences, they were trait measures (Pekala, Steinberg, & Kumar, 1986), assessing what are effectively experience-related tendencies, what Kumar et al. (1996, p. 233) refer to as "enduring characteristics" such as the capacity for absorption (i.e., a trait describing the ability to become

focused on "inward" experiences and imaginings to the exclusion of extraneous external stimuli). Allport (1956) defined traits in terms of consistency in behaviour; that is, in terms of "equivalent responses"[1] under similar conditions (p. 330). In order to extend the research into the subjective experiences of individuals, Pekala and Levine (1981-1982) considered what the best way to analyse experiences would be. They claimed that: "…although much theorizing exists on the nature of consciousness and its various states, there is less than adequate phenomenological research to evaluate the validity of that theorizing" (Pekala & Levine, 1981-1982, p. 30). As they were interested in examining altered states of consciousness, they discussed[2] the possibility of five different methods that were currently in use including:

- *Self-report questionnaires:* individuals evaluate different aspects of their experiences retrospectively using a questionnaire measure;
- *Thinking out loud:* individuals state out loud what they are experiencing while they are experiencing it;
- *Narrative thought sampling:* letting individuals go about normal everyday activities and sporadically interrupting them to ask them about their experience just prior to the interruption;
- *Thought sampling using ratings:* individuals rate experience according to specific items; and
- *Event tabulation:* individuals report the number of times that various subjective experiences occurred during a specific time period.

Each of these methods has their advantages and disadvantages. For example, letting individuals verbalise what they are experiencing while they are experiencing it (i.e., thinking out loud) has the advantage of immediacy. There is no time for other distractions to impede on the thought processes of the individual so they are in the best possible position to be able to articulate what they are experiencing at that particular moment. On the other hand, using narrative thought sampling has the disadvantage of needing the person to rely on their memory in order to report their thoughts (Klinger, 1978). This can sometimes result in less than accurate recall as the order of the thoughts can be less than clear in a person's mind.

[1] In addition, Allport (1956) makes the point to the reader that we should never expect "perfect consistency" in behaviour. The environment is an important determinant of individual behaviour and we as humans often act in contradictory ways. This is not to infer that the definition of individual traits is impossible. Rather that the "…the consistency of a trait is entirely a matter of degree" (Allport, 1956, p. 332).
[2] From Klinger (1978).

Pekala and Levine (1981-1982) examined each of the aforementioned methods and thus determined that if individuals could be provided with a questionnaire that asked them to rate their subjective experience for the preceding time period only, then this would be the best kind of measure of phenomenology. Thus they developed the Phenomenology of Consciousness Questionnaire (PCQ), a measure of subjective experience. This measure of 37 items, once finalised using cluster analysis, contained nine major dimensions comprising internal dialogue, awareness, imagery, positive affect, volition, altered experience, attention, negative affect, and memory. Of these nine, four clusters (awareness, imagery, altered experience, and attention) were composed of two or more sub-clusters for a total of ten in all.

This initial exploration into the best way to "map consciousness" (Pekala & Levine, 1981-1982) led to further research. For instance, Pekala et al. (1986; Pekala, 1991a) later developed a measure of state effects called the Dimensions of Consciousness Questionnaire (DCQ) which was a revision of the PCQ. The DCQ aimed to examine the subjective state experience of individuals under specific conditions associated with an altered state of consciousness. These conditions included the effects of recreational drugs, hypnosis, and meditation (Pekala et al., 1986). This measure was longer than the PCQ (74 items; 11 major and 18 minor dimensions), but Pekala et al. (1986) also developed an abbreviated version which contained 40 items. The DCQ's major dimensions included imagery, attention, altered experience, awareness, positive affect, negative affect, memory, internal dialogue, rationality, volitional control, and arousal (Pekala et al., 1986). In an initial study employing the DCQ, Pekala et al. (1986) had 112 participants sit quietly with their eyes open and think about anything they liked. At the end of four minutes, participants completed the questionnaire in reference to the time when they sat thinking about whatever they liked. Both the regular and abbreviated versions of the DCQ were found to be as valid as the PCQ, in that they both reliably permitted researchers to "…map subjective experience according to specific dimensions and sub-dimensions of consciousness" (Pekala, 1991a, p. 126). Initial research on the DCQ found that the measure had adequate to good internal consistency, with Cronbach's alphas ranging from .65 to .93 for the major dimensions.

The importance of distinguishing between trait and state aspects of subjective experience as they relate to altered states such as those experienced in hypnosis was expounded by Zuckerman, Persky, and Link (1967). They defined an affect trait as being a reliable indicator of mood over an extended period of time. An affect state, on the other hand, was defined as an affect level at

some specific point in time or in response to a specific stimulus. Zuckerman et al. (1967) also made the important point that affect states cannot be measured with the same instruments as those used to measure affect traits. They raise the point that trait questionnaires tend to word items in relation to how people "usually" or "generally" feel[3], not how they feel at the specified moment or as a result of the stimulus (Zuckerman et al., 1967). Thus, making the distinction between state and trait enables researchers to investigate how a specific stimulus affects individuals and, in relation to Zuckerman et al.'s (1967) research, why some individuals are more easily able to enter into altered states of consciousness.

With further research and modification, involving the dropping of some items in order to improve alpha reliability levels, the DCQ was modified into the Phenomenology of Consciousness Inventory (PCI). The PCI now contained 53 items, gained an additional major dimension (self-awareness), and reduced the minor dimensions to 14. Pekala et al. (1986) ran an additional study in order to reassess the reliability of the measure. Two hundred and sixty-three participants were asked to sit with their eyes closed and think about whatever they liked for four minutes. They then completed the PCI with reference to the eyes closed condition. On a second occasion, participants experienced a hypnotic induction condition using the Harvard Group Scale of Hypnotic Susceptibility, Form A (Shor & Orne, 1962). Participants once again experienced a four minute condition where they were told to "continue to experience the state you are in right now" (Pekala et al., 1986). Afterwards they completed the PCI in reference to the time they experienced the four minute condition. Under both conditions Pekala et al. (1986) found that the PCI has adequate internal consistency. Under the eyes closed condition, Cronbach's alphas averaged .76 across the major dimensions, and under the hypnotic induction condition alphas averaged .80 (Pekala et al., 1986).

In additional research employing the PCI, Kumar et al. (1996) examined individuals' subjective experiences during hypnosis. Using the major dimensions and the "non-overlapping PCI (sub)dimensions" (Pekala & Kumar, 2007, p. 179), in an exploratory factor analysis, Kumar et al. (1996) discovered five state factors which they named dissociated control, positive affect, negative affect, attention to internal processes, and visual imagery. They referred to these as state effects as they were the products of the hypnotic induction.

[3] An example of this kind of wording can be found in Lee-Teng's (1965) Hypnotic Characteristics Inventory where the questions are framed in exactly that way (e.g., "In general…", "Do you often have…" etc.).

3.1.2 The Current Study

While the PCI has been shown to be a useful measure of subjective experience under both alert or altered state inductions, and following Kumar et al. (1996), the aim of the current study was to use the PCI to examine the structure of experience while listening to a trance induction. Earlier, a distinction was made between state and trait. For the purposes of the current study a distinction was made between trait absorption, described as "…a *capacity* for absorbed and self-altering attention…" (italics added; Tellegen & Atkinson, 1974, p. 276) and state absorption as the subjective experience of that capacity for absorption (Kumar et al., 1996). The aims of this study run parallel to (while extending) those of Kumar et al. (1996). Whereas they studied the structure of experience in a resting state in the context of hypnosis, the current study sought to uncover the structure of experience during a trance induction procedure completely distinct from a hypnotic context. In order to uncover this structure, exploratory factor analysis was employed. It was therefore hypothesised that up to five latent variables would be found in the major and minor dimensions of the PCI. These latent variables, once identified, will then be used in subsequent analyses.

In Chapter 2, Tellegen's (1981) two modes of attentional deployment, the instrumental mental set and the experiential mental set, were discussed. As previously mentioned, the instrumental mental set is characterised by "reality-orientated, effortful and goal-directed striving" whereas the experiential mental set is defined as "effortless, non-striving, and non-volitional attentional" (Ott, 2007, p. 263). An additional aim of this study, and based on the work of Tellegen (1981), was thus to test this model of instrumental and experiential sets as the state expressions of trait absorption. Thus in the exploratory factor analysis employed, it was hypothesised that: (a) a factor corresponding to the experiential mental set would be found, (b) a factor corresponding to the instrumental mental set would be found, and (c) (during the induction) there would be a substantive inverse relationship between the two factors.

This study, in an extension of Kumar et al.'s (1996) work, aimed to examine the structure of conscious experience corresponding to the state expression of the trait of absorption. Further, it tested Tellegen's (1981) model of the expression of trait absorption as a result of the interplay of two mutually exclusive frameworks of consciousness: the experiential and instrumental mental sets.

3.2 Method

3.2.1 Participants

Data were collected from 241 students (197 females, 44 males) studying first year psychology. Participants ranged in age from 18 to 66 years for females ($M = 32.06$, $SD = 10.52$) and 18 to 59 years ($M = 32.98$, $SD = 11.71$) for males. An independent samples t-test revealed no significant differences between males and females in age, $t(239) = -.51$, $p = .607$, $d = -0.09$. Participation in the study was voluntary and data collection began once approval was granted from the University of New England (UNE) Human Research Ethics Committee.

3.2.2 Materials

A series of questionnaires were administered to each participant in order to measure their subjective responses. In addition to requesting the participant's age and sex, the questionnaire package employed two additional scales[4]. However, in this study, the only questionnaire of interest was that designed to measure phenomenological (subjective) experience. Participants were also required to listen and to experience to the best of their ability a trance induction audio file prior to the completion of the questionnaire measures.

Phenomenological experience. The subjective experience of the experimental manipulation was measured by way of the PCI (Pekala, 1991a). The PCI is a 53-item measure with each item consisting of two dipole statements separated by a 7-point Likert scale ranging from 0 to 6. The PCI measures 12 major and 14 minor dimensions of consciousness. These dimensions are as follows (with the minor dimensions in brackets): (a) attention (absorption, direction); (b) rationality; (c) volitional control; (d) altered experience (meaning, body image, time sense, perception); (e) positive affect (sexual excitement, joy, love); (f) internal dialogue; (g) negative affect (sadness, anger, fear); (h) memory; (i) imagery (amount, vividness); (j) self-awareness; (k) arousal; and (l) altered state of awareness. Twenty-eight items are reverse scored and items are then summed together to achieve total scores for each of the subscales.

The PCI has satisfactory internal consistency as indicated in prior research. For instance, at the time of its development, Pekala (1991a) calculated the alpha as averaging .82 for all the major

[4] The measures used included the Modified Tellegen Absorption Scale (MODTAS; Jamieson, 2005) and the shortened form of Betts' Questionnaire Upon Mental Imagery (QMI; Sheehan, 1967). These additional measures will not be analysed in this study.

dimensions and .82 for the major and minor dimensions combined. Cronbach's alphas for this current sample ranged from a low .44 to a high of .88. The average alpha for the major dimensions for this sample was an acceptable .75, and for the major and minor dimensions combined the alpha was .77.

Audio material. An audio file based on a script developed by Jamieson (2007; see Appendix D) was used to place participants in a positively induced trance state. This script was a slight modification of a hypnosis induction designed for use in the functional magnetic resonance imaging (fMRI) environment (see Egner et al., 2005). In the revision by Jamieson (2007), the word "hypnosis" was removed, and in this study it was described as guided imagery to minimise the impact of expectancy effects potentially associated with terms such as "hypnosis" or "trance." This induction procedure seeks to elicit a state of deep absorption in inner-generated bodily experiences, feelings, and imaginings and has been specifically adapted for use in conjunction with the PCI (Pekala, 1991a). Together, the script and the PCI aimed to assess the structure of consciousness associated with the induction of a state of absorption (Jamieson, 2007).

The audio presented to participants in this study was an abbreviated version of approximately 10 minutes in length and spoken in a female voice. The use of a pre-recorded induction was regarded as an advantage as it allowed for the presentation of a standardised procedure and ensured that all participants, day-to-day, received exactly the same instructions in exactly the same tone of voice (see e.g., Ulett, Akpinar, & Itil, 1971).

The audio permissively encouraged the listener's experience, but deliberately refrained from performance demands and avoided specific directions or details. It asked the listener to "Let go of your everyday thoughts and concerns" and to let the "everyday world…melt away." It offered the listener various images to imagine, including "float[ing] like an autumn leaf fluttering lightly in the breeze" or envisaging oneself as an "astronaut piloting their spacecraft to a landing on a distant planet," but ultimately it encourages the listener to simply experience whatever thoughts and feelings occur at the time; to simply "let it happen" (Jamieson, 2007). Thus the audio sought to elicit a state of mind characterised by engagement with inner-generated imaginings and experiences which, if successful, may be described as a trance induction. Otherwise, the state elicited is a simple volitional response to specific imagery instructions (much like the items comprising the Betts' QMI).

3.2.3 Procedure

Students studying first year psychology were informed that one alternative for partial fulfilment of their unit requirements, a study of factors in the self-regulation of the stress response, was available for participation. While they were informed that participation was entirely voluntary, students were encouraged to take part as the data generated would also be used for a class assignment.

Participants were recruited via Blackboard©, the online learning environment employed by UNE. The idea that students were able to complete this experiment at any location they liked, as all that was required was access to a computer with an internet connection, was both innovative and beneficial. Not only can the internet provide more flexible options for participants, but in research presented elsewhere, and utilising the current data set, the possibility of using the internet for the remote assessment of hypnotic abilities has been demonstrated (see Jamieson & Loi, 2009). Once a student had logged on to Blackboard© and consented to participate in the study, they were guided to an external internet site that informed them of the instructions of the study. To begin, they were required to give their age and gender before moving on to a page which provided the instructions for the PCI. Following this, participants were informed that they were to listen to a 10-minute trance induction audio file preceded by the following instructions: "Please listen to the following audio track before progressing to the next page. You should do this in a quiet environment away from any interruptions or distractions. Your task while listening is simply to become engaged with the suggested experiences to the best of your ability."

Upon completion of the trance induction, participants were required to complete a copy of the PCI following the instructions given earlier. Participants were instructed that the PCI pertained only to the experiences they had whilst listening to the audio and that time only. Following completion of the PCI, participants then completed two additional questionnaires not analysed in the current study. Once participants had completed all the components of the experiment they were presented with a "Thank you" screen which informed them that their data had been input automatically into a database.

The website was left open for prospective participants to take part for approximately three weeks. Once data collection was completed it was collated and analysed by the researcher and disseminated to students for use in their assignment.

3.3 Results

3.3.1 Structure of Trance Induction Experience as Measured by the PCI

An exploratory factor analysis (EFA) with a principal components extraction was conducted on 21 major and minor subscales of the PCI in order to examine the structure of experience whilst listening to an absorption state induction. The decision was made to exclude composite or derivative subscales and to include only the simple or primary subscales (whether considered major or minor) in order to minimally constrain the representation of the structure of the trance induction experience in the measurements comprising the PCI.

Cattell's (1966) scree plot and Kaiser's (1960) rule (eigenvalues greater than one) were employed to determine how many factors should be retained. The scree plot (see Figure 3.1) suggested four or five factors provided the best solution. Kaiser's rule indicated five factors. Both the four and five factor solutions were assessed using PROMAX rotations. The PROMAX rotation was chosen for the reason of simplicity in interpretability (see Abdi, 2003), as well as to allow further examination of the correlation matrix between the factors. This matrix thus allows the researcher to examine the strength of the relationship between the rotated factors. Examining the resulting pattern matrix, it was determined by these criteria that a four or five-factor solution, respectively, was optimal. The five-factor solution was then selected on the basis of intelligibility (simple structure) of the rotated solution, explaining 65%[5] of the total variance.

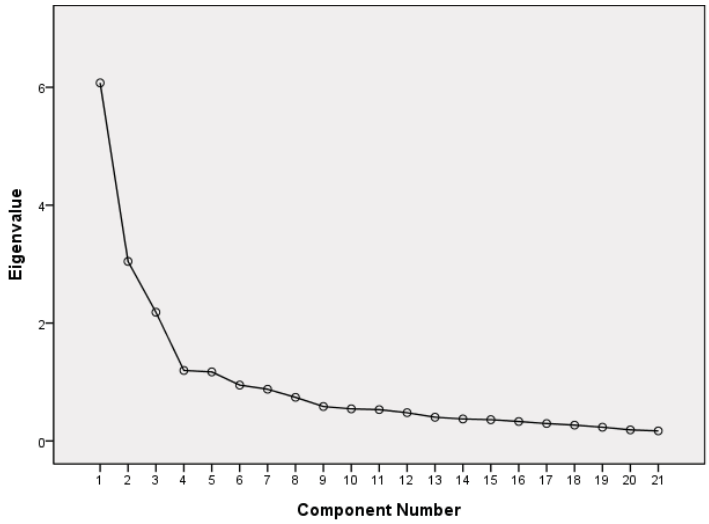

Figure 3.1. The scree plot indicating the number of factors to be retained.

[5] After oblique rotation, the variance explained by each factor is not reported. Because factors correlate, the percentage of variance explained is not additive (Tabachnick & Fidell, 2001).

The number of items comprising each of the factors ranges from seven to two. Only those items with loadings above .4 were retained. The resulting pattern matrix of factor loadings showed an excellent approximation to simple structure (Tabachnick & Fidell, 2001) with all the PCI dimensions loading on one and one only of the five underlying factors. The individual items and their loadings are presented in Table 3.1. In addition, the correlations between the five factors are presented in Table 3.2. Following the recommendations of Cohen (1988), the principal results indicate a moderate to large relationship between the factors of Altered Awareness and Positive Affect and Imagery. Positive Affect and Imagery also shared a medium positive relationship. In addition, a small negative relationship was found between Self-Control and Altered Awareness as well as between Self-Control and the two affect dimensions.

3.3.2 Dimensions of the PCI

The EFA of the PCI produced the following five-factor solution:

1. *Altered Awareness* (7 items). The items in this factor describe the experience of a fundamental alteration in the awareness of self and world. It closely parallels Tellegen's (1981) description of the experiential mental set.
2. *Negative Affect* (4 items). The items in this factor describe emotions related to anger, sadness, and fear. The inclusion of arousal in this factor is an indicator of muscle tension (Pekala, 1991a) and thus is associated with the somatic manifestation of the negative affects tapped by this factor.
3. *Self-Control* (5 items). The items in this factor describe the experience of volitional, realistic awareness and control of self; what Shor (1959) described as the GRO. This factor illustrates the extent to which self-awareness is intact, memory and rationality are not impeded, volitional control is maintained, and internal dialogue is kept to a minimum. It closely corresponds to Tellegen's (1981) description of the instrumental mental set.
4. *Positive Affect* (3 items). The items in this factor describe emotions related to joy, sexual excitement, and love.
5. *Imagery* (2 items). The items in this factor describe the amount of imagery experienced during the absorbed state and the vividness of that imagery.

Table 3.1

Principal Components Analysis with PROMAX Rotation of Five-Factor Solution of Trance Experience

Item	1	2	3	4	5
	Altered awareness	Negative affect	Self-control	Positive affect	Imagery
Joy				.72	
Sexual excitement				.82	
Love				.70	
Anger		.84			
Sadness		.79			
Fear		.65			
Body image	.65				
Time sense	.78				
Perception	.74				
Meaning of experience	.58				
Amount of imagery					.87
Vividness of imagery					.94
Direction of attention	.91				
Absorption	.75				
Altered state of awareness	.90				
Self-awareness			.65		
Memory			.66		
Volitional control			.61		
Rationality			.82		
Internal dialogue			.45		
Arousal		.69			

Note. Following the recommendations of Tabachnick and Fidell (2001), pattern matrix loadings >.4 are reported.

3.3.3 Reliability of the Five Factors

Reliability analyses of the five factors reflected adequate to high internal consistency for the current sample, with Cronbach's alphas for each factor as follows: (a) Altered Awareness .89; (b) Negative Affect .73; (c) Self-Control .65; (d) Positive Affect .75; and (e) Imagery .83. All but the factor Self-Control exceeded the usually accepted lower limit of .70; however, as Hair, Anderson, Tatham, and Black (1998) state, a Cronbach's alpha of .60 is acceptable in exploratory research.

Table 3.2

Bivariate Correlation Matrix of the Five-Factor Solution

Factor	1	2	3	4
1. Altered awareness	-			
2. Negative affect	-.25	-		
3. Self-control	-.22	-.12	-	
4. Positive affect	.37	.20	-.12	-
5. Imagery	.49	-.11	-.07	.35

3.3.4 The Relationship of the Five Factors with Tellegen's Mental Sets

The results of the EFA exposed the emergence of five latent factors from the PCI. In addition, two of these factors also seem to demonstrate a corresponding relationship with Tellegen's (1981) two mental sets, the instrumental and the experiential. The Self-Control factor corresponds closely with the instrumental mental set with an emphasis on active, effortful, realistic, goal-directed behaviour. Individuals experience no alteration in dimensions such as volitional control, rationality, and self-awareness. The Altered Awareness factor, on the other hand, seems to correspond closely to Tellegen's (1981) experiential mental set with its emphasis on absorption and alteration in consciousness, awareness, perception, time sense, and so on. A modest negative relationship (r = -.22) between these two factors was uncovered.

3.4 Discussion

The aim of the current study was to use the PCI to examine the structure of experience whilst individuals listened to and tried to experience a trance induction presented by the internet as a recorded audio file. The results of the EFA indicated that from the initial 21 dimensions included

in the analysis, five factors of phenomenological experience emerged from the trance induction, all showing acceptable internal consistency. These factors, named Altered Awareness, Negative Affect, Self-Control, Positive Affect, and Imagery provide numerous possible combinations (state-space) for the location of the experiences that occur under a trance induction (including, even, no change in ongoing awareness).

As predicted, one of the factors (Self-Control) closely corresponded to Tellegen's (1981) notion of an instrumental mental set, while another factor (Altered Awareness) closely corresponded with his description of an experiential mental set. While it was hypothesised that a strong inverse relationship would be observed between these two factors (i.e., the presence of one would effectively exclude the other), this hypothesis was only partially supported with a weak negative relationship (r = -.22) being revealed instead.

Tellegen's (1981) formulation regarded the instrumental and experiential mental sets as mutually exclusive as an individual could experience either set while following the induction procedure depending on their propensity for absorption. However, Tellegen's (1981) account implies that individuals cannot experience both mental sets at the same time. Thus, for example, an individual, high in absorption ability, could *set aside* the instrumental set when the conditions are favourable and adopt an experiential set. However, they cannot experience the instrumental set at the same time they are experiencing the experiential set. The results of the current study, however, present an alternative picture of the relationship of these mental sets to that which Tellegen (1981) described. Rather than being mutually exclusive, these results indicate that the factors (and associated mental sets) are partly independent constructs. Thus what these results are indicating is that it is in fact possible for an individual, given a trance induction, to report experiences corresponding to either or both mental sets in the same short space of time. To a certain degree, this apparent contradiction between these two positions (mutually exclusive versus independent), and the result that the Self-Control and Altered Awareness factors were weakly negatively correlated (r = -.22), may derive from the distinction between traits versus state measures. Chaplin, John, and Goldberg (1988) define traits as stable, consistent, and long-lasting, while states are temporary, unstable, and relatively brief phenomena. They also acknowledge that theorists such as Allport (1937) and Cattell (1957, as cited in Chaplin et al., 1988, p. 549) have made the claim that "…states are caused primarily by conditions external to the person, whereas traits are causal factors that reside within the person." The PCI is a state

measure; it quantifies subjective experience in relation to a specific stimulus condition or context. But the ability to become absorbed, to experience an alteration in state of awareness, perception, time, and so on is also dependent on individual traits. So too is the experience of maintaining volitional control, rationality, or memory. The expectation that people would be either reality-focused or become engaged with self-altering experiences, thus giving rise to mutually exclusive dimensions of experience do not fit the data at least over the timeframe studied here. If Tellegen's (1981) formulation was correct, we would expect to see a much stronger negative correlation between the factors corresponding to the instrumental and experiential mental sets. What is in fact being seen in these results is much more complex. What is actually occurring is either the co-presence or else the alternating presence of Altered Awareness and Self-Control dimensions in the experience of trance induction subjects. Many individuals reported experiencing both intact self-control and an alteration in awareness (i.e., both instrumental *and* experiential mental sets) in the same brief time period. This finding may have a parallel in the interplay between the awareness of elements of reality and non-reality in the closely related area of hypnosis that has been noted by many researchers. For instance, Sheehan and McConkey (1982) have acknowledged that:

> …reality bears a complex relationship to positive response to hallucination suggestion, and data challenge somewhat the assumptions that are made in the literature about the extent to which subjects refrain from actively processing information while positively responding to hypnotic instructions. (p. 180)

From the results of the current study, it is clear that many individuals, who during the trance induction's instructions report entering a state of altered awareness, are at the same time cognisant of their internal and external reality (see e.g., Lynn, Weekes, & Milano, 1989).

This apparent incongruity in the "state-space" relationship between Altered Awareness and Self-Control (experiential and instrumental sets) has many parallels with the controversy which occurred in an earlier period of psychometric research regarding the structure of affective experience. Initially, psychometric research sought to test the intuitively plausible claim that the traits of positive and negative affect were bipolar – that they were opposite ends of a single dimension. However, many subsequent results suggested that positive and negative affect were in

fact independent dimensions (for a review see Russell & Carroll, 1999). It is now clear that the latter is indeed the case as negative and positive affect have been shown to have distinct neural substrates (e.g., Phan et al., 2005). In fact, the results from the current study also support this contention as positive and negative affect emerged as separate dimensions of experience-space (the vector space of phenomenological descriptions).

The presence of multiple dimensions in the experience-space of the trance induction supports those researchers with multidimensional models of the trance induction process such as Shor's (1962) three-factor model of the dimensions of hypnotic experience which includes transference, motivational, and relationship dynamics. This model proposes that the three dimensions can vary independently. One of Shor's (1962) dimensions, archaic involvement, taps affective experience as a core component. Archaic involvement is Shor's (1962) transference element mentioned previously. Shor (1979, p. 126) describes depth of archaic involvement as "…the extent to which at any given moment in time, there are archaic, primitive modes of relating to the hypnotist that echo back to the love relationships of early life." This (or something very similar) was found in the current study where the factor Positive Affect, incorporating the elements of love, joy, and sexual excitement, was experienced during the trance episode and in response to the induction instructions. Shor (1979) also points out that it is not only positive feelings that may be evoked. In some instances, there may also be feelings of hate or other strong emotions. Feelings of hate, anger, and sadness are the three elements that compose the Negative Affect factor in the current study. Interestingly, Shor's (1962) dimension of trance may also be related to the factor Altered Awareness. He describes one aspect of trance as "obliviousness," whereby the individual "…ceases to be consciously aware of time, self, surroundings, etc." (Shor, 1979, p. 123). This definition shares many features with the Altered Awareness factor in the present study as individuals lose their sense of time and perception and become less aware in general.

It is also important that in the current study, Imagery emerged as a separate factor, positively correlated with both Altered Awareness (r = .49) and Positive Affect (r = .35). The clear and vivid imagery elicited when listening to the trance induction is associated with alterations in PCI body image, time sense, perception, meaning, attention, and absorption. The substantive relationship found between Imagery and Altered Awareness indicates the importance of imagery in providing the content as distinct from the framework of the experience for those who were engaged in an altered sense of self during the trance induction.

3.4.1 Categorical Versus Dimensional Methods

Research conducted by Pekala and colleagues in particular (Pekala, 1991a; Pekala et al., 1986; Pekala & Levine, 1981-1982) led to the development of, initially, the PCQ, which they proceeded to amend and redevelop over time until producing the PCI. Initially, Pekala and Levine (1981-1982) employed *K*-means cluster analysis to determine the structure of the PCQ, the predecessor of the PCI. Cluster analysis uses respondents (as opposed to variables) who are then arranged into clusters based on the similarity of their responses (Krebs, Berger, & Ferligoj, 2000). This determines the structure of the measure. There has, however, been some criticism of the use of cluster analysis as a suitable technique of determining structure. For instance, Ruscio and Ruscio (2008) have stated that one of the difficulties with this type of analysis is that there exists no statistical method to determine the *number* of clusters to retain. Thus it lies with the researcher to make a subjective determination. With factor analysis, though, there exist a number of statistical rules that assist the researcher in ascertaining the number of factors to retain. The most commonly employed of these rules include Cattell's (1966) scree plot and Kaiser's (1960) eigenvalues greater than one. Other possible methods of factor retention include Velicer's (1976) minimum average partial (MAP) test and Horn's (1969) parallel analysis. Any one of these rules in isolation or all in combination can assist the researcher in deciding the number of factors to retain in a factor analysis. A factor analysis is principally applied to the correlation matrix. One of the strengths of factor analysis is its ability to cope with the unique properties of correlation matrices including the reversal of variable scores. When a questionnaire item's score is reversed, it simply changes the sign in front of the correlation value in the matrix. It does not change anything else in the output. With cluster analysis, however, such a reversal would completely change the output and thus the interpretation of the results (Darlington, n.d.). Thus cluster analysis and dimensional analysis represent distinct alternative methodologies for utilising the PCI to examine the structures of conscious experience during a trance induction or related psychological procedures. While each approach has its own distinctive strengths, the current study has sought to further develop the dimensional approach while Pekala himself has sought instead to apply the PCI in a categorical framework.

Using the *K*-means cluster analysis framework, Pekala and colleagues (Forbes & Pekala, 1996; Pekala, 1991b; Pekala & Forbes, 1997; Pekala, Kumar, & Marcano, 1995) sought to determine if there might be qualitatively different types of hypnotic subjects. These studies

examined individuals at all levels of hypnotic susceptibility (low, medium, and high) to determine whether each level would contain subgroups or clusters of individuals whose experiences of hypnosis differed when assessed by the PCI (Pekala & Kumar, 2007). In an initial study, Pekala (1991b) concluded that two types of highly susceptible individuals (i.e., fantasy highs and classic highs) and three groups of low susceptible individuals (i.e., classic lows, pseudolows, and dialoguing lows) could be identified. These types were identified according to individuals' alterations in awareness, experience of imagery, positive affect, volitional control, rationality and memory, as well as amount of internal dialogue.

Additional studies followed. Pekala et al. (1995) replicated two types of highly susceptible individuals, one which was comparable to the aforementioned classic, and another which they labelled compliant. The compliant type was determined to be similar to Pekala's (1991b) fantasy type. Following Pekala et al.'s (1995) study, Forbes and Pekala (1996) used cluster analysis across low and high susceptible individuals and were able to once again replicate the classic types; however, these researchers concluded that rather than there being either a separate fantasy or compliant type, there was in fact a type which was a composite of these two.

This research program converged in Pekala and Forbes (1997) presenting a typology of nine hypnotic types which may be described as follows:

- *Classic lows:* high arousal; intact memory, rationality, and self-awareness; high internal dialogue; lowest drop in volition.
- *Relaxed lows:* this type is similar to the classic lows; however, they experience less arousal and less internal dialogue.
- *Non-dialoguing mediums:* lack of internal dialogue.
- *Dialoguing mediums:* this type is similar to non-dialoguing mediums: however, they experience more internal dialogue.
- *Visualising high-mediums:* high level of visual imagery; high self-awareness and intact memory.
- *Rational high-mediums:* less internal dialogue; more rationality.
- *Dialoguing high-mediums:* this type is similar to rational high-mediums; however, they experience more internal dialogue and less rationality. They also experience the second highest level of internal dialogue after classic lows.

- *Fantasy highs:* experience the second highest level of imagery after visualisers.
- *Classic highs:* low level of memory, rationality, internal dialogue, imagery, and self-awareness.

By comparison, combinations of higher and lower scores on the five continuous PCI trance induction dimensions obtained in the current study seem to provide an alternative description of the nine typological categories outlined in Pekala and Forbes (1997). First, higher Self-Control scores with a reality orientation (self-awareness, memory, volitional control, rationality, and internal dialogue) are clearly features of the classic lows, relaxed lows, dialoguing mediums, visualisers, rational high-mediums, and dialoguing high-mediums while non-dialoguing mediums and classic highs would display low Self-Control scores. Second, high Altered Awareness scores, which include variations in body image, time sense, perception, meaning of experience, direction of attention, absorption, and awareness would clearly be present in the classic highs with low Altered Awareness scores found in the classic lows. High Imagery factor scores, describing the amount and vividness that an individual experiences, appear to be an important component in both the visualising high-mediums and fantasy highs. Low Negative Affect scores, which includes arousal, are found in the relaxed lows and the non-dialoguing mediums. Finally, high Positive Affect scores are expected to be present in the visualising high-mediums and fantasy highs.

3.4.3 Conclusion

The current study used EFA to reveal the existence of five correlated factors (Altered Awareness, Negative Affect, Self-Control, Positive Affect, and Imagery) underlying the phenomenological descriptions derived from 21 items of the PCI during a trance induction procedure in a sample of university students.

The key finding in this study was the confirmation of two PCI derived dimensions in the trance induction experience closely corresponding to Tellegen's (1981) instrumental and experiential mental sets. The Self-Control factor, involving effortful, realistic, goal-directed behaviour corresponds closely with the instrumental mental set. Additionally, the Altered Awareness factor corresponded with the experiential mental set with its emphasis on alterations in consciousness, awareness, time, body image, and attention. These are the two mental sets postulated to be central to the state expressions of trait absorption. Tellegen (1981) proposed that

in an absorption evoking context, individuals will either continue to experience a reality focus (an instrumental set) *or* they will surrender this focus and instead become engaged with internally generated self-altering experiences (an experiential set). In Tellegen's (1981) formulation, the two sets are mutually exclusive. Thus in order to become engaged with a self-altering experience (i.e., employ the experiential set), for instance, individuals need to *set aside* the instrumental set. However, results from the current study appear to directly contradict this aspect of Tellegen's model. If Tellegen (1981) was correct, the negative correlation between the Self-Control and Altered Awareness factors should have been much larger than the relatively modest value (r = -.22) found. This result demonstrates that, at least over several minutes, these two factors (and corresponding mental sets) while related are far from mutually exclusive. That is, individuals in the current study were found to have experiences corresponding to *either* or *both* mental sets during the trance induction. Unexpectedly, some individuals experienced both Self-Control and Altered Awareness in the same brief timeframe.

These five factors bear a close resemblance to Kumar et al.'s (1996) five dimensions extracted in the context of a standard hypnotic testing procedure. It is likely, then, that these factors themselves are core dimensions for describing individual differences in trance experience rather than being unique to this specific trance induction method. These factors give a parsimonious account of the typological categories of trance experience and should, therefore, be subject to careful evaluation as a possible foundation for assessment of skills underlying various forms of trance response (e.g., hypnotic suggestion) in both applied clinical and academic research settings.

CHAPTER 4

STUDY 2

4.1 Introduction

In Chapter 3, an exploratory factor analysis identified five latent factors in the Phenomenology of Consciousness Inventory (PCI; Pekala, 1991a), derived from its 21 (non-overlapping) major and minor dimensions, when recorded in reference to a trance induction procedure. These five dimensions represented a coordinate system which, in future studies, may be used for mapping the variability and organisation of phenomenological reports of individuals' responses to trance induction. These PCI trance components were identified as: Altered Awareness, Negative Affect, Self-Control, Positive Affect, and Imagery. As noted in the previous chapter, the PCI is a state measure. However, it is expected that the state elicited in some by a trance induction, is, in part, an expression of relevant trait factors. Therefore the PCI dimensions identified in this context are expected to have systematic relationships to relevant trait measures. Previous research has highlighted the potential roles of Tellegen and Atkinson's (1974) trait of absorption and of imagery ability (Sheehan & Robertson, 1996). Self-report measures of imagery assess an individual's ability to form clear, vivid sensory-like images of perceptual events described in simple instructions. Consequently, traditional imagery measures (e.g., Sheehan, 1967) elicit volitional (i.e., consciously deliberate) responses made in an ordinary reality-oriented frame of mind. Both absorption and imagery abilities have been proposed to play a role in generating the experiences which may emerge during trance state induction (Barber, 2000). The extent to which these roles are similar or different is expected to be evident in the relationship of these trait measures to the different dimensions (PCI factors) which describe the patterns of these experiences.

4.1.1 Absorption and Imagery Abilities

4.1.1.1 Absorption Ability

In Chapter 2 it was noted that absorption was initially defined as a capacity to intensely focus or concentrate on some item to the exclusion of other distracting stimuli. However, Tellegen (1981) redefined the trait of absorption as the capacity to shift from an instrumental (i.e., effortful/volitional) to an experiential (i.e., effortless/involuntary) mental set, able to be elicited by certain external stimuli (e.g., reading a book or watching a movie) or by certain internal, self-generated stimuli (e.g., thoughts, images, or imaginings).

Recent research has found that absorption has a genetic "loading" (Geraerts, Merckelbach, Jelicic, Smeets, & van Heerden, 2006) and so this ability must posses a specific neurobiological and evolutionary basis in addition to occurring in response to particular contexts. Wilson and Barber's (1983a) work specifically highlights the use of absorption in fantasy as a coping mechanism for difficult developmental and life circumstances and calling upon one's absorption ability to act as a defensive shield in response to traumatic events. However, such responses will not be available for those individuals who are low in the relevant traits. In fact, trait measures of absorption, fantasy, daydreaming, and hypnotic suggestibility are significantly correlated with trait measures based on descriptions of what are considered to be dissociative experiences (e.g., Fassler, Knox, & Lynn, 2006; Giesbrecht et al., 2008; Hutchinson-Phillips et al., 2007; Kihlstrom, Glisky, & Angiulo, 1994; Seligman & Kirmayer, 2008).

Twin research by Jang, Paris, Zweig-Frank, and Livesley (1998), has found genetic influences for reports of dissociation in both pathological and nonpathological contexts. The findings of their study (conducted on 329 twin pairs) led the researchers to the conclusion that environmental influences differentiated pathological and nonpathological dissociation in their sample. Jang et al. (1998) also determined that 45 percent of the genetic variance was common to pathological and nonpathological dissociation reports, indicating a common "vulnerability" underlying both pathological and nonpathological dissociation. Supporting the notion of pathological and nonpathological forms of dissociation, other research has referred to absorption as a sort of "normative" (or nonpathological) dissociation (e.g., Butler, 2006; Seligman & Kirmayer, 2008). Normative dissociation is not only ubiquitous in the general population, it is considered by these authors as corresponding to normal shifts in experience due to variation in attention and information processing (Seligman & Kirmayer, 2008). Butler (2006) states, however, that normative dissociation's pervasiveness is not well appreciated. For many people, dissociation is often associated only with pathological experiences (e.g., dissociative identity disorder, fugue states, etc.). But trait dissociation can be readily measured in both pathological *and* nonpathological contexts. As such, Butler (2006, p. 45) refers to ordinary events such as the "…flow of perceptions, purposeful thoughts, fragmentary images, distant recollections, bodily sensations, emotions, plans, wishes, and impossible fantasies…" as prime examples of everyday dissociation. Seligman and Kirmayer (2008) refer to such unremarkable examples of absorption in film, television, books, and music as being capable of prompting episodes of normative

dissociation. Butler (2006), then, prefers the term normative dissociation rather than nonpathological dissociation as this removes any negative connotations or associations.

4.1.1.2 Imagery Ability

Imagery ability, defined as the ability "…to generate mental images and become absorbed in them as if they were real…" (Kwekkeboom, Huseby-Moore, & Ward, 1998) has often been investigated in relation to other associated concepts such as fantasy proneness, absorption, and hypnotic suggestibility. This definition, however, is offered specifically in relation to guided imagery interventions in a clinical context. Just as people vary in the traits of fantasy proneness and absorption, so too do they vary in the vividness, clarity, and amount of imagery they are able to generate. Betts (1909) himself described two forms of mental imagery: voluntary imagery and spontaneous imagery. Voluntary imagery was described as the ability to elicit certain specified images. Gordon (1949) referred to this as "controlled imagery" whereby the imagery elicited is under the individual's control. Spontaneous imagery, on the other hand, was described by Betts (1909, p. 5) as the "normal functioning of imagery in the mental processes." That is, the normal use of imagery in everyday thought. Gordon (1949, p. 166) referred to this as "autonomous imagery" whereby the imagery "…at times…pursue[d] its own course irrespective of the conscious wishes and desires of the subject." In addition, imagery has also been defined in terms of introspective ability, the vividness and clarity of evoked images, and the ability to employ imagery to solve problems (see Kosslyn, Brunn, Cave, & Wallach, 1984) such as those involved in visual-spatial tasks.

The history of how imagery ability has been measured is a long one beginning with Fechner who in 1860 first proclaimed that imagery was a subject worthy of investigation (White, Sheehan, & Ashton, 1977). Early attempts to measure imagery required individuals to verbally report on their experiences and then have investigators interpret what these reports revealed about their imagery (Sheehan, Ashton, & White, 1983). As objective measurements could not be assured, these measures instead relied on an individual's own subjective interpretation of the imagery they generated. These initial questionnaires were thus oriented toward defining the nature of imagery. In other words, investigators were interested in defining imagery *types* (White et al., 1977). By 1977, however, White et al. (p. 149) reported that there had been a "paradigm shift" and while research into the various self-report measures of imagery ability was "strong and

viable," these measures now "…emphasized the function of imagery rather than its nature" (Sheehan et al., 1983, p. 189).

Some of the earliest attempts at objective assessment of imagery, dating back to 1909 with a questionnaire created by Titchener, attempted to emphasise the "…notion of 'type' rather than heterogeneity of function" (Sheehan et al., 1983, p. 189). So if a researcher was interested in visual imagery, for example, they would generally be less interested in examining any other type of imagery (e.g., auditory, etc.). Other researchers (e.g., Angell, 1912; Davis, 1932; Woodworth, 1938, as cited in Sheehan et al., 1983) followed a similar path of objective assessment. However, as Sheehan et al. (1983) state, "…early objective tests of imagery seemed to have too little to offer to justify their use by researchers." The problem seemed to rest with the fact that these measures relied on introspection for their interpretation.

There were, however, other researchers who aimed to move away from merely examining imagery type. This is epitomised in Betts' (1909) Questionnaire Upon Mental Imagery (Betts' QMI; Sheehan, 1967), a 150-item measure of image generation. Betts' questionnaire was an attempt to measure the vividness and clarity of an individual's imagery. This aim was achieved by presenting individuals with lists of items and asking them to think of seeing, hearing, feeling, tasting, smelling, and sensing each of the suggested images. In other words, the measure examines imagery generation in each of the seven sensory modalities. Participants then record the vividness and clarity of each of the listed items on a 7-point scale ranging from total clarity to not being able to conjure any image at all. In its original state, though, the Betts' QMI was prohibitively long. Sheehan (1967), recognising the problem this presented to participants, modified the measure and created a shortened form comprising just 35 items. This amended tool has been widely used in research and has been found to be a valid and reliable measure of mental imagery ability (e.g., Kwekkeboom et al., 1998). Thus from this point onwards the reader is to assume that when the Betts' QMI is mentioned it refers to the amended Sheehan (1967) version.

Several studies have investigated these related concepts of absorption and imagery ability. For instance, Josephine Hilgard (1970), one of the original investigators of imaginary involvement, discovered that there was a subset of individuals who were capable of intense involvement in various activities, from reading to music to immersion in religious or spiritual matters. This engagement in imaginative activities to the exclusion of distractions in the environment is reminiscent of the concept of absorption (Hilgard, 1970). Hilgard (1974) also found that among

those high in hypnotic susceptibility, there was a manifest interest or enjoyment in sensory experiences, in particular, those found in the natural environment. These findings were supported by Wilson and Barber (1981) whose "excellent hypnotic subjects" experienced fantasy in all sensory modalities. Wilson and Barber (1981, p. 134) stated that these individuals "…'see,' 'hear,' 'smell,' 'touch,' and fully experience what they fantasize." These findings, therefore, lend support for the contention that imagery ability and absorption ability are inherently related.

Lynn and Rhue (1986) investigated the characteristics of fantasy prone individuals and found that those high in the trait of fantasy proneness also displayed greater levels of absorption (as measured by the Tellegen Absorption Scale [TAS]; Tellegen & Atkinson, 1974), greater hypnotic responsiveness, greater responsiveness to waking suggestion, greater vividness of mental imagery (as measured by the Betts' QMI), and more creativity than those medium or low in fantasy proneness. This finding, therefore, offers support to the research of both Hilgard (1970, 1974) and Wilson and Barber (1981).

Barnier and McConkey (1999), in a study investigating the relationship between absorption and hypnotisability in different contexts[6], found a significant negative correlation ($r = -.33$, $p < .001$) between the absorption measure (TAS; Tellegen & Atkinson, 1974) and the Betts' QMI for their sample, indicating that the higher the absorption scores the lower the Betts' QMI scores. This finding confirmed that individuals high in absorption were also high in imagery ability[7]. This finding again supports research stating that the two concepts are related.

[6] The researchers referred to these conditions as: a) the imagination condition, in which participants were required to complete the TAS in addition to other questionnaires assessing imagery and imagination and b) the classroom condition, in which participants completed the TAS in isolation at the beginning of a tutorial class.

[7] While a negative correlation result may seem counterintuitive, it is in fact quite sound. This is because the Betts' QMI is scored contrary to expectations with 1 being the generation of a strong and clear image and 7 being no image is generated at all.

4.1.1.3 Individual Differences in Absorption Ability and Imagery Ability

The above mentioned examples of research providing support for the relationship between absorption ability and imagery ability also provide another important finding. That is, that there are individual differences in the two abilities. Lynn and Rhue's (1986) results touched on this detail in their finding of a significant difference between those high in absorption and imagery ability (among other capacities) and those medium or low in those abilities (all p values ranging from $< .05$ to $< .01$). Pekala, Wenger, and Levine (1985) also found similar results in their study of individual differences in absorption. Pekala et al. (1985) found significant correlations between absorption[8] and several dimensions of the PCQ (all p values $< .05$), a precursor of the PCI, including high imagery, inner-focusing attention, decreased self-awareness, and altered awareness, meaning, perception, time sense, and body image. In a second experiment, Pekala et al. (1985) found significant differences (all p values ranging from $< .05$ to $< .001$) between those high and low in absorption on several dimensions of the Abbreviated Dimensions of Consciousness Questionnaire (ADCQ), a refined version of the PCQ. Their results indicated that those high in absorption (relative to those low in absorption) experienced significantly more positive affect, more and vivid imagery, and greater alterations in self-awareness, meaning, perception, time sense, and body image in both the eyes open and eyes closed conditions that were utilised in this study. Importantly, the researchers also determined that "…individuals of varying absorption ability are…in different identity states of consciousness…" (Pekala et al., 1985, pp. 130-131) indicating that there is a fundamental difference in the phenomenology of the trance experiences of those high in absorption and those medium or low in the trait. In addition, Pekala et al. (1985) also found similar patterns of correlations between the ADCQ and absorption as they did with the PCQ and absorption. The only additional dimension that exhibited a significant positive correlation with absorption in this study was positive affect.

Qualls and Sheehan (1981b) also investigated those high and low in absorption in an electromyograph biofeedback condition. They hypothesised that for those high in absorption, instructions intended to encourage the use of imagery during biofeedback would result in their focusing their attention on self-generated imaginative experiences. In other words, it would highlight their aptitude for imaginative involvement. For those low in absorption, Qualls and

[8] Pekala et al. (1985) measured absorption ability using the absorption subscale of Tellegen's (1980) Differential Personality Questionnaire (DPQ). This questionnaire is now known as the Multidimensional Personality Questionnaire (MPQ; see e.g., Tellegen et al. [1988]).

Sheehan (1981b) predicted that the provision of instructions to encourage imaginative involvement would have little effect. The results of this study provided support for the hypotheses. First, for those high in absorption, the muscular relaxation achieved was higher during the instructions-provided condition compared with the other conditions (i.e., biofeedback with no instructions provided and no feedback). In addition, the results also supported the hypothesis relating to those low in absorption. On the whole, providing this group with instructions designed to facilitate self-generated imagination made no appreciable difference, whereas the biofeedback condition allowed them to attain significant improvements in relaxation. Thus this study provides additional support for the contention that there is a difference between those high in absorption and those low in the trait in their ability to invoke their capacity for inner-generated imaginative involvement with the distinct consequence being the regulation of the psychophysiological stress response.

The elementary nature of the fundamental difference between those high and low in absorption and imagery ability was touched upon in Chapter 2 in the discussion of Tellegen's (1981) distinction between the experiential and instrumental mental sets. As previously mentioned, the experiential mental set defines individuals who are open to the flow of qualitative experience, whatever that may entail ("...sensory or imaginal...;" Tellegen, 1981, p. 222), whereas the instrumental set is defined by the effort to control it. Thus those high in absorption (and, by default, imagery ability, as it has been determined that these constructs are indeed related) are more likely to adopt, given a particular "*class of circumstances*" (Sheehan et al., 1983), an experiential set (and to set aside an instrumental set). On the other hand, those low in absorption are more likely to adopt an instrumental set. Thus, Sheehan et al. (1983) claim that the adoption of either the experiential or instrumental set is dependent on the level of an individual's capacity for imaginative involvement.

4.1.2 The Current Study

The rationale for the current study was, in part, to replicate and extend the study by Pekala et al. (1985) who investigated whether individuals of different levels of absorption ability experience different states of consciousness during both an eyes open waking condition and an eyes closed condition where "…daydreaming and imagery might be more prominent" (pp. 127-128) and using both the PCQ and ADCQ. The other facet of this study, given that absorption has been found to be related to self-report measures of imagery ability, was to extend the findings of

Pekala et al. (1985) by investigating whether individuals of different levels of imagery and absorption ability experience different states of consciousness in this condition. This has not been examined in the literature and so will provide additional information on the role of imagery and absorption abilities in the generation of experience in trance states. Thus the aim of this study was to investigate how imagery and absorption abilities relate to the structures of consciousness elicited by a trance induction as measured by the PCI trance factors identified in Study 1.

The principal aim of this thesis is to investigate the putative role of trance-like dissociation in responses to witnessing traumatic events. To that end, in Study 1, the key dimensions in the structure of individual differences in experience during a standardised trance condition were discovered by a five-factor solution of the PCI. In the current study, this tool was employed to examine the respective roles of the traits absorption and imagery vividness in the generation of experience in the same trance (normative dissociation) inducing conditions. It was therefore predicted, based on extending previous research to the five-factor PCI trance factors identified in Study 1, that: (a) the trait of absorption ability would positively correlate with the PCI dimensions of Altered Awareness, Positive Affect, and Imagery. This prediction follows from the results obtained by Pekala et al. (1985) and the Study 1 finding that the dimension Altered Awareness closely corresponded to Tellegen's notion of an experiential mental set; therefore it was expected that trait absorption would be uniquely associated with this dimension. In addition, (b) the trait of imagery ability (as measured by the Betts' QMI; Sheehan, 1967) would negatively correlate with the PCI dimensions Self-Control and Imagery. Study 1 found that Self-Control closely corresponded to Tellegen's (1981) notion of an instrumental mental set. As the generation of imagery (as measured by the Betts' QMI) requires an act of deliberate effort, it was expected that this imagery trait would be uniquely associated with PCI Self-Control. Multiple regression analyses were also employed in order to assess the unique relationship of the five PCI dimensions with trait absorption and to test the predictions that: (c) the PCI factor Altered Awareness, proposed to correspond to Tellegen's (1981) experiential mental set, would uniquely predict trait absorption, and (d) the PCI factor Self-Control, proposed to correspond to Tellegen's (1981) instrumental mental set, would uniquely predict the trait of imagery vividness.

Furthermore, it was also hypothesised that these relationships would be due to the specific abilities of high scorers. Thus: (e) those high in the trait of absorption would experience greater Altered Awareness, Positive Affect, and Imagery during a trance induction relative to those

medium or low in the trait, and finally, (f) those high in the trait of imagery ability would experience greater Self-Control and clearer and more vivid Imagery relative to those medium or low in the ability. These latter hypotheses were tested by way of between-groups analyses of variance (ANOVAs) with planned contrasts. The aim of this investigation, therefore, was to examine the different ways that different imagery abilities are engaged in the generation of different patterns of trance experience.

4.2 Method

4.2.1 Participants

Data were collected from the same 241 students (197 females, 44 males) studying first year psychology at UNE as took part in Study 1.

4.2.2 Materials

Two additional questionnaires were administered to each participant in order to measure the traits of absorption and imagery vividness (in addition to phenomenological measures of trance experience).

Absorption. An individual's level of absorption was measured using the 34-item Modified Tellegen Absorption Scale (MODTAS; Jamieson, 2005). The original Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974) was found to tap the personality trait absorption. The TAS employed a dichotomous true/false response format; however, the MODTAS was adjusted so that the responses were now measured on a 5-point frequency scale ranging from 0 (*Never*) to 4 (*Very often*). Participants thus respond to how frequently a statement is true of their experience. For example, "When I listen to music, I get so caught up in it that I don't notice anything else", and "While watching a movie, a TV show, or a play I become so involved that I forget about myself and my surroundings and experience the story as if it were real and as if I were taking part in it." Items are then summed to achieve an overall score with scores ranging from 0 to 136. The MODTAS contains five subscales which are as follows: (a) aesthetic involvement in nature (five items; e.g., "I like to watch cloud shapes change in the sky"); (b) altered states of consciousness (four items; e.g., "I experience things as if they were doubly real"); (c) imaginative involvement (nine items; e.g., "Some things that might seem meaningless to others make sense to me"); (d) extrasensory perception (three items; e.g., "I somehow sense the presence of another person

before I actually see or hear him/her"); and (e) synaesthesia (four items; e.g., "Certain pieces of music remind me of pictures or moving patterns of colour").

The original TAS has been found to have acceptable internal reliability (e.g., Zachariae, Jørgensen, Bjerring & Svendsen, 2000; α = .82). The Cronbach's alpha for the MODTAS for the current sample was a high .94.

Imagery ability. An individual's capacity to image was measured by way of the Betts' QMI (Sheehan, 1967). The Betts' QMI measures vividness and clarity of an individual's imagery, or the picture that appears in their mind when prompted by the questionnaire. Participants then rate this image's vividness on a 7-point Likert scale ranging from 1 (*Perfectly clear and vivid*) to 7 (*No image at all*) with total scores ranging from 35 to 245. Thus, though counterintuitive, high scores on this measure indicate low imaging ability. The Betts' QMI also comprises seven subgroups or sensory modalities comprising five items each. These include: (a) visual (thinking of a relative/friend and imagining e.g., "The exact contour of face, head, shoulders and body"); (b) auditory (the sound of e.g., "The honk of an automobile"); (c) cutaneous (the feel or touch of e.g., "Sand"); (d) kinaesthetic (the performance of e.g., "Kicking something out of your way"); (e) gustatory (the taste of e.g., "Oranges"); (f) olfactory (the smell of e.g., "Fresh paint"); and (g) organic (sensations such as e.g., "Hunger"). The Betts' QMI is widely used, and has high internal consistency (e.g., Kwekkeboom et al., 1998; α = .91; Watanabe, Fukuda, & Shirakawa, 2005; α = .97). The Cronbach's alpha for the current sample also had high internal consistency at .96.

Phenomenological experience. The 53-item PCI (Pekala, 1991a) was again used to measure participants' subjective experiences of the experimental manipulation. Based on the results of the factor analysis from Study 1, the five-factor version was employed in this and subsequent analyses. The Cronbach's alphas for each dimension for this sample indicated acceptable internal consistency and were as follows: (a) Altered Awareness α = .84, (b) Negative Affect α = .73, (c) Self-Control α = .65, (d) Positive Affect α = .75 and (e) Imagery α = .83

Audio material. The 10-minute trance induction audio file based on a script developed by Jamieson (2007)[9] provided instructions to elicit a state of absorption in self-generated experience.

[9] As utilised in Study 1.

4.2.3 Procedure

Students studying first year psychology were informed as part of their unit requirements that a study in the training of self-regulation of the stress response was available for participation. While they were informed that participation was entirely voluntary, students were encouraged to take part as the data generated would be used for a class assignment.

Participants were recruited via Blackboard© and were able to complete this experiment at any location they liked as all that was required was access to a computer with an internet connection. Once a student had logged on and agreed to participate, they were guided to an external internet site that informed them of the instructions of the study. As outlined in Study 1, they were required to give their age and gender before moving on to a page which provided the instructions for the PCI. Following this they were informed that they were to listen to a 10-minute audio file of an absorption state (i.e., trance) induction.

Upon completion of the audio file, participants completed a copy of the PCI pertaining to the experiences they had whilst listening to the audio. Following completion of the PCI, participants were then presented with the MODTAS and Betts' QMI and were asked to complete these in order to provide information about their experience of imagination in everyday life and the quality of the imagery they generate in different sensory modalities, respectively.

4.3 Results

4.3.1 Descriptive Statistics and Bivariate Correlation Analyses

Means and standard deviations for the PCI factors, Altered Awareness, Negative Affect, Self-Control, Positive Affect, and Imagery as well as the total MODTAS and Betts' QMI scores are presented in Table 4.1.

Table 4.1

Means and Standard Deviations for the PCI Five-Factor Model, Total MODTAS, and Total Betts' QMI

Variable	Mean (*SD*)
Altered awareness	57.07 (25.67)
Negative affect	6.54 (7.55)
Self-control	53.20 (11.49)
Positive affect	9.18 (7.66)
Imagery	10.36 (6.01)
Total MODTAS	69.78 (21.64)
Total Betts' QMI	91.95 (33.57)

An initial bivariate correlation analysis was conducted between the total MODTAS and Betts' QMI scores in order to determine the relationship between absorption and imagery. The results of this analysis demonstrated an approximate medium negative relationship between absorption ability and imagery ability ($r = -.27$, $p < .001$).

Bivariate correlation analyses were then conducted in order to assess the size and direction of the linear relationship between the total absorption score and the five major dimensions of the PCI. As may be observed in Table 4.2, and in support of the first hypothesis, there were significant ($p < .001$) positive medium relationships between absorption ability and increased Altered Awareness, Positive Affect, and Imagery.

Correlation analyses were also conducted between the total imagery ability score and the five PCI dimensions. As shown in Table 4.2, the only significant result ($p < .05$) was for Self-Control. Therefore the second hypothesis was only partially supported as no significant relationship was found between the imagery ability score and the PCI dimension of Imagery. However, closer scrutiny of the relationship between trait imagery vividness and the two PCI sub-dimensions which comprise the Imagery factor show that while the Betts' QMI (trait) imagery ability measure has a nonsignificant correlation with the PCI sub-dimension of (state) imagery amount ($r = -.02$, $p = .812$), it does have a significant correlation ($r = -.14$, $p < .05$) with the PCI sub-dimension of (state) imagery vividness.

Table 4.2

Bivariate Correlation Matrix of the Five-Factor PCI, Total MODTAS, and Total Betts' QMI

Variable	1	2	3	4	5	6
1. Altered awareness	-					
2. Negative affect	-.16*	-				
3. Self-control	-.23***	-.11	-			
4. Positive affect	.54***	.05	-.09	-		
5. Imagery	.42***	.01	.02	.42***	-	
6. Total MODTAS	.30***	-.03	-.04	.29***	.27***	-
7. Total Betts' QMI	-.06	.00	-.15*	-.09	-.08	-.27***

Note. $^{*}p < .05$, $^{***}p < .001$

4.3.2 Predicting Absorption and Imagery Ability

Two multiple regression analyses were conducted in order to determine which of the five major dimensions of the PCI (independent variables; IVs), if any, uniquely predicted the dependent variables (DVs) of absorption ability and imagery ability, respectively. Assumption testing revealed several univariate outliers on Negative Affect, Self-Control, and Positive Affect. One multivariate outlier was also detected. However, these outliers were retained as there was no reason to assume that any individual was not a valid member of the population.

In combination, the five PCI dimensions accounted for 12.8% of the variance in absorption ability ($R^2 = .13$, $Adj\ R^2 = .11$), $F(5, 235) = 6.88$, $p < .001$. As may be observed in Table 4.3, only Altered Awareness had a significant unique relationship with absorption ability. Thus the hypothesis stating that the Altered Awareness factor (corresponding to Tellegen's (1981) experiential mental set) would uniquely predict trait absorption was supported.

Table 4.3

Predicting Total Absorption Ability from the PCI Five-Factor Model

Predictor	B	95% CI for B		β	sr^2
		LB	UB		
Altered awareness	.14*	.01	.28	.17	.02
Negative affect	-.01	-.37	.35	-.01	.00
Self-control	.02	-.22	.25	.01	.00
Positive affect	.41	-.02	.83	.14	.01
Imagery	.48	-.02	.98	.13	.01

Note. CI = Confidence Intervals; LB = Lower Bound, UB = Upper Bound
*$p < .05$, ***$p < .001$

A second regression analysis was also conducted to investigate which (if any) of the five PCI dimensions (IVs) had a unique relationship with imagery ability (DV). Prior to running this analysis, the same assumption violations (as for the absorption analysis) were noted. In combination, the five PCI dimensions accounted for a nonsignificant 3.8% of the variance in imagery ability ($R = .04$, $Adj\ R^2 = .02$), $F(5, 235) = 1.86$, $p = .103$. However, as may be observed in Table 4.4, Self-Control had a significant unique relationship with imagery ability. Therefore, the hypothesis stating that Self-Control (corresponding to Tellegen's (1981) instrumental mental set) would predict trait imagery ability was also supported.

Table 4.4

Predicting Total Imagery Ability from the PCI Five-Factor Model

Predictor	B	95% CI for B		β	sr^2
		LB	UB		
Altered awareness	-.09	-.30	.13	-.07	.00
Negative affect	-.12	-.70	.47	-.03	.00
Self-control	-.51*	-.90	-.12	-.18	.03
Positive affect	-.28	-.96	.41	.06	.00
Imagery	-.11	-.93	.70	-.02	.00

Note. CI = Confidence Intervals; LB = Lower Bound, UB = Upper Bound
*$p < .05$

4.3.3 Analyses of Individual Differences in Absorption Ability

The MODTAS was further investigated following the regression analysis in order to see if level of absorption ability (i.e., low, medium, or high) had an affect on the subjective experiences of individuals as measured by the five major dimensions of the PCI. Individuals' scores on the MODTAS were organised into one of the three groups which were then used for further analysis.

Scores on the MODTAS for the current sample ranged from a low of 16 to a high of 131 (out of a possible 136). A distributional approach to recoding (de Vaus, 2009) was used in order to define three groups of approximately equal size. As such, the low absorption group (n = 83) was defined as an individual who scored below 59; medium absorption (n = 76) was defined as those who scored between 60 and 78; and high absorption (n = 82) was defined as anyone who scored above 79.

Initially, a series of independent samples t-tests were conducted in order to ensure that there were significant differences between the groups on their absorption scores. Results indicated that the high absorption group (M = 93.59, SD = 10.87) scored significantly higher on the MODTAS than the low absorption group (M = 46.27, SD = 10.25), $t(163) = -28.76$, $p < .001$, $d = 4.48$. In addition, the high absorption group scored significantly higher than the medium absorption group (M = 69.78, SD = 4.95), $t(115.09) = 17.92$, $p < .001$, $d = 2.78$. Finally, the medium absorption group scored significantly higher than the low absorption group, $t(120.54) = -18.65$, $p < .001$, $d = 2.88$.

Following the t-tests, a series of one-way between-groups ANOVAs with planned contrasts were conducted in order to investigate whether level of absorption (IV) had an effect on the subjective experiences of individuals as measured by the five-factor PCI (DVs). Prior to conducting the analyses, relevant assumptions were checked. A violation of Levene's homogeneity of variance was found for the variables Self-Control and Positive Affect. However, as ANOVA is robust to this violation if groups are of approximately equal size (as in this instance) this breach was not a concern.

Results indicated that three of the PCI dimensions were affected by an individual's level of absorption: (a) Altered Awareness, $F(2, 238) = 9.38$, $p < .001$, $\eta^2 = .07$; (b) Positive Affect, (2, 238) = 9.02, $p < .001$, $\eta^2 = .07$; and (c) Imagery, $F(2, 238) = 9.15$, $p < .001$, $\eta^2 = .07$. No

significant results were found for either Negative Affect $F(2,238) = .69$, $p = .505$, $\eta^2 = .01$ or Self-Control $F(2,238) = 1.46$, $p = .234$, $\eta^2 = .01$.

Table 4.5 shows the means and standard deviations of the five variables by level of absorption and Table 4.6 presents the results of the planned contrasts analyses.

Table 4.5

Means and Standard Deviations for the Five-Factor PCI by Level of Absorption Ability

Variable	Group	Mean (Standard Deviation)
Altered awareness	Low	48.51 (25.05)
	Medium	57.62 (21.83)
	High	65.22 (27.10)
Negative affect	Low	7.30 (7.17)
	Medium	5.96 (8.37)
	High	6.30 (7.13)
Self-control	Low	53.80 (9.56)
	Medium	51.37 (12.94)
	High	54.30 (11.80)
Positive affect	Low	7.11 (6.72)
	Medium	8.53 (6.73)
	High	11.89 (8.58)
Imagery	Low	8.88 (5.55)
	Medium	9.61 (5.54)
	High	12.55 (6.30)

Results indicated that those individuals high in absorption ability experienced significantly more Positive Affect and vivid Imagery during the trance induction than those low and medium in absorption ability. In addition, high absorption individuals also experienced significantly greater Altered Awareness than low absorption individuals.

Table 4.6

Planned Contrasts for Level of Absorption Ability

Variable	Group Comparison	*t*
Altered awareness	Low – Medium	-2.31*
	Medium – High	-1.92
	Low – High	-4.32***
Negative affect	Low – Medium	1.12
	Medium – High	-0.29
	Low – High	0.85
Self-control	Low – Medium	1.34
	Medium – High	-1.49
	Low – High	-0.31
Positive affect	Low – Medium	-1.33
	Medium – High	-2.75**
	Low – High	-3.98***
Imagery	Low – Medium	-0.79
	Medium – High	-3.18**
	Low – High	-4.01***

Note. Levene's homogeneity of variance was violated for Self-Control and Positive Affect. The equal variances not assumed *t* values for these variables are reported.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

4.3.4 Analyses of Individual Differences in Imagery Ability Scores

In addition to the analyses conducted on the absorption ability scores, individuals' imagery ability was further analysed using the same methods as those employed for the MODTAS. The aim of this analysis was to investigate whether level of imagery ability (i.e., low, medium, or high) had an affect on the subjective experiences of individuals as measured by the five-factor PCI.

Scores on the Betts' QMI for this sample ranged from 35 to 239 (out of a possible 245). As for the MODTAS, groups were generated using the distributional approach with high imagery ability

defined as those who scored less than 77 (n = 79); medium imagery ability as those who scored between 78 and 98 (n = 79); and low imagery ability as those who scored more than 99 (n = 83).

Once again a series of independent samples t-tests were conducted to see if there were significant differences between the groups. Results indicated that the high imagery ability group (M = 61.48, SD = 10.79) scored significantly lower on the Betts' QMI than the low imagery ability group (M = 125.89, SD = 32.69), $t(100.45) = -17.00$, $p < .001$, $d = -2.67$. The high imagery ability group also scored significantly lower than the medium imagery ability group (M = 86.75, SD = 5.84), $t(120.15) = -18.31$, $p < .001$, $d = -2.91$. In addition, the medium imagery ability group scored significantly lower than the low imagery ability group, $t(87.49) = -10.73$, $p < .001$, $d = -1.69$.

Following the t-tests, a series of one-way between-groups ANOVAs with planned contrasts were conducted in order to determine whether level of imagery ability (IV) has an effect on individuals' subjective experiences as measured by the five-factor PCI (DVs). Table 4.7 presents the means and standard deviations for each of the five dimensions. Again, relevant assumptions were checked with a violation of Levene's homogeneity of variance found for both Negative Affect and Positive Affect. Again, however, as the groups were approximately equal in size, this violation was not a concern.

Table 4.7

Means and Standard Deviations for the Five-Factor PCI by Level of Imagery Ability

Variable	Group	Mean (Standard Deviation)
Altered awareness	Low	52.82 (22.92)
	Medium	59.67 (24.46)
	High	58.92 (28.26)
Negative affect	Low	6.90 (7.62)
	Medium	7.51 (8.55)
	High	5.19 (6.17)
Self-control	Low	51.64 (12.04)
	Medium	52.51 (10.23)
	High	55.54 (11.86)
Positive affect	Low	8.14 (6.87)
	Medium	9.15 (7.12)
	High	10.30 (8.80)
Imagery	Low	9.64 (5.71)
	Medium	10.30 (6.06)
	High	11.16 (6.22)

Results indicated that none of the ANOVAs were significant for any of the variables: (a) Altered Awareness, $F(2, 238) = 1.76$, $p = .174$, $\eta^2 = .01$; (b) Negative Affect, $F(2, 238) = 2.03$, $p = .134$, $\eta^2 = .02$; (c) Self-Control, $F(2, 238) = 2.59$, $p = .077$, $\eta^2 = .02$; (d) Positive Affect, $F(2, 238) = 1.62$, $p = .200$, $\eta^2 = .01$; and (e) Imagery, $F(2, 238) = 1.32$, $p = .270$, $\eta^2 = .01$. Thus level of imagery ability for all groups combined has no effect on an individual's subjective experience during a trance induction as measured by the PCI. However, as may be seen in Table 4.8, individuals high in imagery ability experienced significantly more Self-Control during the trance induction than those low in the ability.

Table 4.8

Planned Contrasts for Level of Imagery Ability

Variable	Group Comparison	*t*
Altered awareness	Low – Medium	-1.70
	Medium – High	-0.18
	Low – High	-1.52
Negative affect	Low – Medium	-0.47
	Medium – High	1.95
	Low – High	1.58
Self-control	Low – Medium	-0.48
	Medium – High	-1.67
	Low – High	-2.18*
Positive affect	Low – Medium	-0.92
	Medium – High	-0.90
	Low – High	-1.74
Imagery	Low – Medium	-0.71
	Medium – High	-0.90
	Low – High	-1.62

Note. Levene's homogeneity of variance was violated for Negative Affect and Positive Affect. The equal variances not assumed *t* values for these variables are reported.
* $p < .05$

4.4 Discussion

The current study sought to determine the respective roles of absorption ability and imagery ability in generating the different patterns of phenomenal experience observed during a trance induction as measured by the five-factor solution of the PCI identified in Study 1. Based on previous research by Pekala et al. (1985) examining the relationship between state manifestations of absorption and the dimensions of subjective experience, and based on the finding from Study 1 that Altered Awareness corresponds with Tellegen's (1981) notion of an experiential mental set, the current study predicted that absorption ability would be associated with the PCI trance factors of Altered Awareness, Positive Affect, and Imagery elicited by absorption and/or trance induction instructions. Furthermore, and pertaining to the finding from Study 1 that Self-Control

closely corresponds to Tellegen's (1981) notion of an instrumental mental set, it was also predicted that the Betts' imagery ability measure would be associated with the PCI trance factors of Self-Control and Imagery elicited by the trance induction instructions. It was further expected that trait absorption would be uniquely related to the Altered Awareness factor and trait imagery (Betts' QMI) to the Self-Control factor.

In addition to the above hypotheses, it was further predicted that those high in absorption ability would experience higher levels of Altered Awareness, Positive Affect, and Imagery relative to those medium or low in the trait. Finally, it was predicted that those high in imagery ability would experience superior Imagery vividness and clarity relative to those medium or low in the ability.

Results of the correlation analyses conducted supported a relationship between absorption ability and experience of Altered Awareness and Imagery elicited by absorption state instructions. These results extend the findings of Pekala et al. (1985) who found significant relationships between absorption (as measured by Tellegen's DPQ) and various PCQ and ADCQ (sub)dimensions relating to alterations in attention, awareness, imagery, and experiences of time sense, body image, perception, and meaning.

The results of these correlation analyses provide important corroboration for the core constructs of Tellegen's (1981) model of absorption as the capacity to shift (in permissive circumstances) from an instrumental mental set to an experiential mental set. The relationship between the PCI dimensions of Altered Awareness, Positive Affect, and Imagery and the MODTAS provides important information about the nature of the absorption experience under a trance induction situation. The experiential mental set was considered by Tellegen as first involving the relinquishing of an instrumental mental set followed by the adoption of open and receptive awareness of whatever experiences may arise when the person is given a permissive context (Tellegen, 1981)[10], such as the absorption/trance induction employed in the present series of studies. The results obtained in the present analysis provide clear support for Tellegen's notion that the nature of the experiential set which is both "...image-oriented and affectively toned..." compared with the instrumental set which is "...reality-oriented and pragmatic" (Tellegen, 1981,

[10] It is important to reiterate that in Study 1, this claim of Tellegen's (1981) was refuted as the two mental sets were found not to be mutually exclusive, but rather, independent. Individuals could experience either *or* both mental sets during the trance induction.

p. 222). Individuals in the current study, after listening to the trance induction audio, experienced an alteration in their awareness of body, time, perception, and attention in addition to various other subjective experiences. They also experienced increased feelings of love and joy as well as increased levels and vividness of imagery. The results, therefore, highlight the fact that these three PCI factors (and underlying processes) are important components of the expression of Tellegen's (1981) experiential set.

Interestingly, though, the MODTAS failed to correlate with the PCI dimension Self-Control (r = -.04, p = .531). While it was not specifically predicted that these two should correlate, in hindsight it provides an intriguing result. One of the most interesting outcomes associated with hypnosis (a trance state as defined above) is that individuals often report a change in the sense of volitional control over their behaviour (Kihlstrom, 2008). If so, it might be expected that absorption ability, as measured by the MODTAS, would negatively correlate with the PCI factor Self-Control given that this dimension is comprised of items related to control, rationality, and self-awareness. However, the results obtained here indicate that absorption (as measured by the MODTAS) is unrelated to the PCI trance factor of Self-Control (identified with Tellegen's instrumental mental set in Study 1).

Also of importance in the results of these analyses is the fact that while the MODTAS correlated with the PCI trance factor of Imagery, the results did not support the hypothesis stating that imagery ability (as measured by the Betts' QMI) would be associated with this particular trance factor. This result was entirely unexpected. It is counterintuitive to discover that the experience of vivid and clear imagery in response to absorption/trance state instructions is not related to imagery ability. The failure of the Betts' QMI to correlate with the PCI Imagery dimension *in the context of the trance induction* suggests that the experience of imagery elicited by the Betts' QMI must be different in some fundamental way from the experience of imagery elicited by the trance induction. A further clue to the nature of this difference is that the Betts' QMI was significantly correlated with the PCI trance factor of Self-Control recalling that Study 1 concluded that Self-Control corresponds to Tellegen's (1981) instrumental mental set.

The results of the multiple regression analyses examining the unique relationship of the five-factor PCI with both absorption and imagery ability revealed that the factor of Altered Awareness (corresponding to alterations in experiences such as body image, time sense, perception, attention, etc.) was the only variable to uniquely predict variance in absorption ability. With

respect to imagery ability, the regression analysis found that the PCI factor Self-Control significantly predicted unique variance in this ability.

Regarding differences in levels of absorption ability and the effect this has on an individual's subjective experience during a trance induction, the results of the ANOVAs with planned contrasts supported the hypothesis that high absorption individuals experience more Positive Affect and more and vivid Imagery than individuals medium or low in the trait. However, for Altered Awareness, the hypothesis was only partially supported as individuals high and medium in the trait did not significantly differ from one another, though high absorption individuals did experience significantly more Altered Awareness than low absorption individuals. These results provide additional information about the nature of the trance induction itself. Providing high absorption individuals with instructions designed to elicit a state of absorption in self-generated imaginal episodes enables these individuals to experience greater alterations in awareness, greater positive affect, and more vivid imagery relative to those low in absorption. This result also supports and extends the findings of Pekala et al. (1985) who found that high absorption individuals (relative to lows) experienced greater modifications in self-awareness as well as more positive affect and more imagery during their experimental condition.

With respect to individual differences in imagery ability, though, the only result found was that individuals high in imagery ability experienced more Self-Control during a trance induction relative to those low in imagery ability. As noted above, this result, while seemingly contrary to expectations, actually provides important information about the nature of both the Betts' QMI and the PCI dimension Imagery as particularly relates to those individuals high in imagery ability.

The likely reason for this apparently perplexing finding is that the experience of the imagery elicited by the trance induction instructions is different in some important and fundamental way from that of the imagery elicited by the instructions provided by the Betts' QMI. The Betts' QMI instructions may be considered to elicit a response requiring mental effort and control. It asks individuals to deliberately envisage a series of specific images described to them. In other words, this measure calls for the controlled selection of specific images. When it asks the participant to think of the taste of an orange or the feel of sand, these are specific and prescriptive. The person is not left to imagine anything other than these particular items. Importantly, it requires effort by the person to control their thoughts and to try to clearly and vividly experience the suggested

items in their “mind’s mouth” or “mind’s touch” or any of the other five sensory modalities. The imagery instructions contained in the trance induction, by comparison, are encouraging rather than prescriptive and are free-flowing or effortless rather than deliberately controlled. They do not require individuals to visualise or imagine specific images; rather they instruct them to “let go” of other thoughts, and to let what happens happen (Jamieson, 2007). Individuals listening to such an induction can potentially undergo innumerable self-generated experiences with no prescribed limits on what they are free to envisage. Thus these are two quite distinct sets of instruction for eliciting imagery. One is asking for a specific image to be deliberately brought to mind and experienced in a specific sense modality; the other encourages people to generate their own personal experience consistent with what is being described.

It is therefore likely that the imagery conjured to mind during a trance induction operates in a different mental set to the imagery encountered in the Betts’ QMI items. The Betts’ QMI requires a deliberate volitional act. A trance induction requires no such intention or sense of control. Thus it is unsurprising that the PCI trance factor of Imagery is not predicted by the imagery ability measured by the Betts’ QMI. It is thus fair to suggest that *imagery ability*, described as an aptitude for summoning up specific images in different sensory modalities, and the ease with which this occurs (Sheehan et al., 1983), is not synonymous with *imagination*, the conjuring of a flow of images not available to perceptual awareness. As Thomas (1999, pp. 207-208) claims, though, “*Prima facie* imagery and imagination are intimately related…‘imagination’ is often used to name the faculty of production (or the mental arena in which the images appear)….” While this statement highlights the interconnectedness of imagery and imagination, the results of the current study highlight the importance of the distinction between them.

4.4.1Limitations

While the current study provided useful and compelling results, some limitations should also be addressed. First is the issue of representativeness. This sample was comprised solely of undergraduate university students studying psychology, thus the question of generalisation must be raised. Student samples are generally the most accessible (i.e., convenient) for researchers; however, they are not necessarily illustrative of the general population. Thus the issue of external validity must, therefore, be acknowledged. In addition, none of the participants were under 18 years of age. While this may not be too limiting in that there was a satisfactory range of ages (i.e., 18 to 66 years for females; 18 to 59 years for males), it is still necessary to be aware of the fact

that adolescents and children were not included in the sample. A further limitation is that the results of this study were dependent on self-reports. Researchers are cognisant of the issue of response expectancy given that it does, to a certain extent, affect test scores. Given that this study was conducted as a psychology class experiment, these students would have an even greater anticipation than a general population regarding what the study was asking.

4.4.2 Conclusion

This study has provided intriguing results particularly concerning the nature of imagery ability and the effects (or lack thereof) this has on the subjective experiences of individuals undergoing a trance induction. The results concerning absorption ability replicated important aspects of previous research (i.e., Pekala et al., 1985), but extended these original findings by employing the five-factor model of the PCI from Study 1.

None of the potential limitations listed above should detract from the findings contained within this study. Absorption ability as measured by the MODTAS, and the phenomenology of a standard trance induction captured by the five trance factors of the PCI (in particular, Altered Awareness, Positive Affect, and Imagery) was significantly related to this ability. Furthermore, individuals high in absorption ability experienced more pronounced subjective experiences (e.g., greater alterations in body image, time sense, perception, awareness and attention; greater feelings of joy and love; more and vivid imagery) during an induction than those medium or low in the ability.

Imagery ability as measured by the Betts' QMI provided intriguing and pertinent results. While the Betts' QMI is a reliable measure of imagery ability, it bears no relation to the trance Imagery factor of the PCI. Rather, it was discovered that the PCI factor of Self-Control alone uniquely predicted the Betts' QMI and that individuals high in imagery ability experience greater Self-Control during a trance induction relative to those medium or low in the ability. This study ultimately determined that there is an important difference between the ability to conjure specific images, as instructed by the Betts' QMI, and to experience the free-flowing images elicited by a trance induction procedure.

CHAPTER 5

STUDY 3

5.1 Introduction

The claim that dissociative states allows individuals to more able to effectively detach from aversive or negative stimuli or events, was initially discussed in Chapter 2. Research supporting this contention has been reported by investigators such as Nixon et al. (2005) who examined a sample of people who had undergone a traumatic event such as a motor vehicle accident or physical assault. In this particular study, individuals were allocated to high and low dissociative groups based on their scores on the Peritraumatic Dissociative Experiences Questionnaire (PDEQ; Marmar, Weiss, & Metzler, 1997), a measure designed to examine dissociative experiences during a trauma. The individuals investigated had been diagnosed with clinical conditions such as post-traumatic stress disorder (PTSD) and acute stress disorder (ASD), so an important question to be resolved is whether the same result (i.e., the ability to dissociate being associated with reduced psychophysiological arousal following trauma exposure) might in fact be found in a nonclinical population. In addition, Chapter 2 also discussed in some detail the dissociative phenomena of detachment and compartmentalisation. To reiterate, detachment may be defined as a sense of separation from either the self or the external world (Holmes et al., 2005). Compartmentalisation, on the other hand, involves a sense of being unable to control those processes and actions normally under volitional control (Holmes et al., 2005). As was also discussed, the sense of a lack of volition that occurs in the somatisation disorders is itself a form of compartmentalisation. Exposure to trauma may result in either of these processes of dissociation being employed as a device to cope with an adverse reality.

In those with sufficient hypnotic susceptibility, specific suggestions are able to produce functional analogues of somatisation disorder and many other dissociative symptoms (e.g., Barnier et al., 2008). In particular, the apparent weakening of volition and self-awareness is a core feature common to both hypnotic responses and dissociative symptoms. In Chapter 2, literature was examined which indicated that individuals high in hypnotisability (a trait with moderate but significant relationships, depending on context, to absorption and fantasy proneness) are able to modulate the processing of experiences which cause them pain or fear and thus cope with the negative affect which arises from them. They are therefore able to suppress their reactions in a manner which clearly parallels the dissociative responses of detachment and

compartmentalisation observed in the clinical context. Results from both Study 1 and Study 2 provide additional support for the use of trance induction as an experimental paradigm for investigating these aspects dissociative states. It is not argued, however, that this paradigm serves as an adequate model for all aspects of clinical dissociation.

Study 1 identified five key parameters of individual variability in the experiences evoked by a standardised trance induction. In that study, five Phenomenology of Consciousness Inventory (PCI; Pekala, 1991a) factors were determined to represent the patterns of experience elicited by the trance induction (i.e., Altered Awareness, Positive Affect, Self-Control, Negative Affect, and Imagery). Two of these factors were found to closely correspond to Tellegen's (1981) definition of two mental sets: the instrumental and the experiential. The findings of Study 1 indicated a correspondence between the experience of Altered Awareness and the experiential mental set. Thus when administered the trance induction (see Study 2), susceptible individuals experienced alterations in their consciousness, awareness, perception, time sense, body image, attention, and so on. Moreover, the Self-Control factor closely corresponded to the definition of the instrumental mental set with its focus on reality, volition, and self-awareness. However, contrary to Tellegen's (1981) model, it was found that, during the trance experience, these two factors were far from mutually exclusive. That is, trance dissociation consists of two distinct, though often related, elements, one corresponding to fundamental changes in the experience of somatic and spatio-temporal embodiment, and the other to the experience of (inner and outer) reality-oriented self-control. This finding appears to parallel the distinction made by Holmes et al. (2005) of two distinct types of dissociative response in the clinical context.

In Study 2, the contribution of the traits of absorption ability (recently linked to trait measures of dissociation; e.g., Kihlstrom et al., 1994; Seligman & Kirmayer, 2008) and imagery ability in the changes in the phenomenological pattern experienced in response to trance induction instructions was investigated. Results indicated, as predicted, that absorption ability was uniquely related to dissociation-like experiences of Altered Awareness evoked by the trance induction. An unanticipated, but highly informative result found in this study was that imagery ability was *not* related to the Imagery factor of the PCI during trance, but rather it was related to the Self-Control factor (defined instead by the experience of volition and realistic awareness and control of self). The conclusion reached based on this finding was that the imagery generated in response to the trance induction can result from two divergent pathways depending on individual differences in

the related traits. One (related to the Betts' Questionnaire Upon Mental Imagery [QMI]; Sheehan, 1967) requires a deliberate, volitional act from the individual; the other (related to trait absorption) is much more unrestrained and allows individuals to simply let go of extraneous thoughts and let what happens happen. In this context, the Betts' QMI is uniquely related to non-dissociative self-regulatory responses, while trait absorption is uniquely related to specifically dissociative experiential responses. The question therefore arises as to the role played by these traits in the actual responses of individuals when exposed to various types of distressing experiences.

5.1.1 Self-Regulation

In general terms, self-regulation is often discussed as a key concept in developmental psychology where it is defined as the child's ability to modulate thoughts, feelings, and behaviour (Posner, Rothbart, Sheese, & Tang, 2007) in order to be able to function effectively in the world. More specifically, Posner et al. (2007) define self-regulation as a "…natural function of brain networks, designed to control the influx of information from the environment…" (p. 391). This latter definition implies an adaptive function enabling the individual to contend with the multitudes of information that competes for attention in the environment. In addition, the ability to regulate one's own responses to environmental stimuli is also advantageous especially with respect to negative or aversive events. Recent research has in fact determined that the several aspects of psychophysiological self-regulation are related to both hypnotic suggestibility and absorption ability (e.g., Jambrik et al., 2005; Ott, 2007; Santarcangelo et al., 2008).

Chapter 2 raised the potential role of trait absorption in relation to psychosomatic self-regulation of stress responses. Related research, conducted by Ott et al. (2002) investigating the cardiovascular effects of rhythmic tilting, determined that individuals who scored high in trait absorption (as measured by the Tellegen Absorption Scale [TAS]; Tellegen & Atkinson, 1974) also demonstrated greater baroreflex sensitivity (regulation of feedback control between blood pressure and heart rate). Additionally, Santarcangelo and Sebastiani (2004) found that hypnotic suggestibility acted as a buffer against the effects of cardiovascular threat. Results indicated that those high in suggestibility, when confronted with a physiological stressor, were protected against the effects of the stressor at a peripheral level with the "…vascular system…differentially controlled with respect to the heart" (Santarcangelo & Sebastiani, 2004, p. 8). Finally, Qualls and Sheehan (1981a) conducted research on the effect on high and low absorption individuals of

electromyographic (EMG) biofeedback. Their findings confirmed that those low in absorption benefit from instructions that guide them in redirecting their thoughts and to help them relax. High absorption individuals, on the other hand, do not require such assistance as they already have alternative skills available to generate relaxation. Qualls and Sheehan (1981a) contend that the high absorption individuals are capable of this type of somatic self-regulation as a result of being able to direct their focus toward inner-generated imaginings and away from external stimuli.

Further research which supports the proposal that the trait of absorption is closely related to autonomic self-regulation includes that by Zachariae et al. (2000) who investigated the role of hypnotic suggestibility and trait absorption on physiological responses to both an experimental stressor condition and a relaxation condition. Results indicated that during the stress condition, heart rate variability in the low frequency (sympathetic reactivity) and high frequency (parasympathetic reactivity) increased in individuals high in trait absorption. From these results, Zachariae et al. (2000) surmised that because absorption involves a disposition to engage in inner-generated experiences, individuals high in this trait become "sensitive" to changes that occur either psychologically or physiologically, assisting their ability to self-regulate these responses.

Thus research indicates that individuals high in trait absorption and, by extension, the closely related trait of fantasy proneness[11] will be able to utilise these abilities in specific ways to self-regulate their responses to aversive conditions. That is, they will be able to engage *states* of absorption in freely generated fantasy experience (trance states) as a specific means of psychophysiological self-regulation. These individuals will likely employ these skills as a mechanism to escape aversive environments or events. But the question is how do these individuals develop these abilities that allow them to control their somatic responses in the first place?

[11] As noted in Chapter 2, measures of absorption (i.e., Modified Tellegen Absorption Scale [MODTAS]; Jamieson, 2005) and fantasy proneness (i.e., Inventory of Childhood Memories and Imaginings [ICMI]; Wilson & Barber, 1983a, 1983b) are often claimed to be virtually indistinguishable due to the fact that they correlate highly and seem to investigate very similar concepts (e.g., Braffman & Kirsch, 1999; Hough, 2006; Lynn & Rhue, 1988; Rhue & Lynn, 1989).

5.1.2 Childhood Trauma and its Measurement

Trauma, its definition and effects on individual wellbeing, was outlined extensively in Chapter 2. There, the clinical definition of trauma, as stated by the American Psychiatric Association in the *DSM-IV-TR* (2000) was defined as any stressor which affects the individual either personally or is witnessed by them occurring to another. Hearing about an event occurring to someone close to the individual also constitutes experiencing trauma. It was noted in that chapter, though, that there remains wide disagreement as to what objectively constitutes trauma. This stems from the fact that what constitutes traumatic exposure is subjective (i.e., what one person regards as traumatic may not be considered so by another). By the same token, defining the structure of a traumatic incident itself is fraught with complexity.

What is not debatable in the research, though, are the reactions of individuals exposed to trauma. Anxiety, depression, and PTSD are just some of the expected outcomes and often individuals will adapt to the event by withdrawing or dissociating from the immediate environment. This dissociation acts as a medium of separating a painful or aversive reality from conscious awareness (Lowenthal, 2000). As outlined in Chapter 2, individuals who are high in absorption ability or in fantasy proneness, much more often than others, recall a history of childhood trauma whereby they used imaginative activities to escape their painful reality (e.g., Lynn & Rhue, 1988). Thus it would be expected that these individuals are more likely than those low in either ability to employ these mechanisms at later in times when exposed to trauma. Also discussed in Chapter 2 was research conducted by Josephine Hilgard (1970, 1974) who used life history interviews to discover that there were two distinct pathways relating to "imaginative involvement." The first path included either having attachment figures who acted as role models to encourage imaginative involvement. The second path, though, was through a childhood infused with either loneliness or severe discipline and punishment. In the latter pathways, the ability to become imaginatively involved served as a means of escaping or coping with an aversive personal environment. Research conducted by Wilson and Barber (1983a) into fantasy prone individuals examined 27 females whom they regarded as highly hypnotisable. Interviews uncovered the fact that nine of the women reported a difficult or stressful early life including experiencing physical abuse. These women used their talent for fantasy to escape their aversive environments thus supporting Hilgard's (1970, 1974) earlier research. The research conducted by Wilson and Barber (1983a, 1983b) led to the development of a measure of fantasy proneness

known as the Inventory of Childhood Memories and Imaginings (ICMI) whose function is to provide information pertaining to adults' recollections of how imaginative they were in childhood, what kinds of imaginative activities and fantasies they engaged in, and how much this fantasising remains a part of their adult lives (Myers, 1983)[12].

Research conducted by Rhue and Lynn and colleagues (e.g., Nash & Lynn, 1985-1986; Nash, Lynn, & Givens, 1984; Rhue & Lynn, 1987) initially concluded that early childhood trauma exposure acts as a "developmental antecedent" to fantasy proneness. This was also initially echoed by Merckelbach et al. (2001) who suggested that there may be many paths to fantasy proneness in adulthood, including mistreatment in childhood. Nash et al. (1984), for instance, found that physical abuse in childhood resulted in these individuals being rated as highly hypnotisable in adulthood. This result is consistent with that obtained by Hilgard (1970, 1974). Additionally, Nash and Lynn (1985-1986) found that individuals who indicated that they experienced severe punishment in childhood were also more likely to be categorised as highly hypnotisable according to the Harvard Group Scale of Hypnotic Susceptibility, Form A (Shor & Orne, 1962). Rhue and Lynn (1987) found that on measures relating to childhood physical punishment, those regarded as high in fantasy proneness recalled more frequent and more severe occurrences than those medium and low in fantasy ability. In addition, they reported using fantasy to "block the pain" more than the comparison groups (Rhue & Lynn, 1987, p. 130).

Waller et al. (2000) also reported that a history of childhood trauma is associated with dissociation as it may have the "…functional utility of avoiding processing the cognitive and emotional consequences of an event that was itself perceived as unavoidable" (p. 84). In their study, Waller et al. (2000) investigated two kinds of dissociation: somatoform and psychological. Somatoform dissociation may be defined as a "…lack of the normal integration of sensorimotor components of experience…" (van der Hart, van Dijke, van Son, & Steele, 2000, p. 34). These "components of experience" include functions such as speaking, feeling, and moving, among others (van der Hart et al., 2000). Thus outcomes such as conversion disorder or experiencing analgesia or heightened pain, among others, are examples of this type of dissociation. Psychological dissociation, on the other hand, involves the aforementioned outcomes of depersonalisation, derealisation, and loss of control, among others (Waller et al., 2000). The

[12] More information concerning the ICMI's (Wilson & Barber, 1983a, 1983b) psychometric properties will be relayed in the Method section of this chapter.

results of their study found relationships between somatic dissociation and childhood trauma involving physical abuse and between psychological dissociation and non-physical trauma.

However, in retrospect, it is now clear that the essentially correlational nature of these investigations does not warrant an unambiguous causal interpretation. Pekala, Angelini, and Kumar (2001) discovered that for the males they investigated, fantasy proneness was as important as child abuse in predicting trait measures of dissociation. They found a large relationship (r = .48) between the measures of trait dissociation (the Dissociative Experiences Scale [DES]; Bernstein & Putnam, 1986) and fantasy proneness (ICMI; Wilson & Barber, 1983a, 1983b) supporting what many researchers had previously contended: that dissociation and fantasy proneness are closely related (e.g., Waldo & Merritt, 2000). A regression analysis used to predict dissociation from childhood trauma and fantasy proneness found that together, these two variables accounted for 35 percent of the variance in the measure of dissociation. Pekala et al. (2001) therefore claim that the importance of fantasy proneness in the aetiology of dissociation should not be underestimated.

However, Näring and Nijenhuis (2005) critically note that the link between traumatic experiences and dissociation may not be a simple cause and effect. Rather, they propose that there are two possible models regarding this relationship. The first model states that the propensity for dissociation already exists in the individual and when aversive events occur (e.g., childhood trauma), this ability "kicks in" to ward off the negative affect. Thus dissociation is conceived as a coping mechanism. The other line of thought is that the capacity for dissociation arises as a *result* of early exposure to traumatic experiences. Näring and Nijenhuis (2005) examined the relationship between trauma and dissociation while accounting for the influence of fantasy proneness (which they in fact measured using the absorption scale as a surrogate). Their results indicated that when absorption is controlled for, the influence of recalled traumatisation on (trait) dissociation is markedly reduced, indicating that individuals who are high in imaginative involvement (i.e., absorption and/or fantasy proneness) may also be prone to a distortion in memory for traumatic events (Näring & Nijenhuis, 2005).

Carlson, Yates, and Sroufe (2009, p. 46) also make the point that there may be two outcomes of any traumatic episode in a child's life that "…initiate a…developmental trajectory of dissociative processes." First, a child who feels secure in their attachment to caregivers may employ dissociation adaptively in response to a traumatic incident in their life. This is achieved by short-term use of the dissociative process (i.e., postponing the experience of negative affect)

until support becomes available. However, as other researchers have discovered, the experience of abuse in childhood, perhaps perpetrated by those selfsame caregivers (a "…disorganized dyadic relational experience…" if there ever was one; Carlson et al., 2009, p. 45) can result in the frequent and maladaptive use of dissociation as a means of escape. This was addressed in more detail in Chapter 2, where the long-term use of dissociative strategies has been associated with hindering trauma recovery (e.g., Littleton et al., 2007). Carlson et al.'s (2009) claims again lend support to researchers such as Rhue and Lynn (1987) who advocate the role of developmental antecedents in the use of dissociation (and, by extension, absorption and fantasy) in adulthood.

While there have been self-report measures developed to investigate the occurrence of stressors in childhood (e.g., Childhood Trauma Questionnaire, Bernstein et al., 1994; Early Trauma Inventory, Bremner, Vermetten, & Mazure, 2000), one that has been found to have strong internal consistency, test-retest reliability and validity is the Child Abuse and Trauma Scale (CATS; Sanders & Becker-Lausen, 1995), a retrospective measure of the recollection of various forms of childhood trauma. This measure has also been found to correlate with adult outcomes through measures of dissociation, depression, and stressful life events (Cohen et al., 2006; Sanders & Becker-Lausen, 1995). The CATS was developed primarily because the researchers "…sought a quantitative measure that would reflect the extent of various forms of physical, sexual, and emotional maltreatment" (Sanders & Becker-Lausen, 1995, p. 316) and so their measure contained three subscales relating to each of these subtypes. The rationale for including different subtypes of abuse was established from research by Briere and Runtz (1988) who, while interviewing 251 female university undergraduates on their experiences of childhood trauma, noted that there was scarce research on the "…long-term psychological effects of child abuse (especially in the case of physical and psychological maltreatment)…" (p. 332). Briere and Runtz (1988) administered a series of questionnaires measuring recall of these forms of mistreatment as dispensed by both the mother and the father. Results indicated that both forms of trauma are likely to occur in the same family and that these forms of abuse were likely to result in outcomes such as anxiety, depression, dissociation, and suicidal ideation. Concluding this research, Briere and Runtz (1988) highlighted the importance of examining the "…child's total experience of victimization or maltreatment from a variety of sources…" (p. 336) as simply concentrating on just one form of abuse is not always appropriate. The reason for this, as stated by Kent and Waller (1998), is that children rarely experience one type of abuse in isolation. Thus

Sanders and Becker-Lausen's (1995) scale contains questions relating to neglect or a negative home environment, sexual abuse, and physical abuse or punishment.

In 1998, in an extension of the original CAT scale, Kent and Waller added another dimension in the form of emotional abuse. Kent and Waller's (1998) reasoning for such an addition was that it had previously been claimed that "…psychological maltreatment is the core issue in child maltreatment…" (Hart & Brassard, 1987, p. 160). In their discussion of psychological maltreatment, Hart and Brassard (1987) also claimed that the impact of such abuse had been ignored for too long by mental health professionals. As such, other researchers have since realised the toll that emotional abuse can have on the psychological wellbeing of adults (e.g., Briere & Runtz, 1988).

Emotional abuse may be defined in terms of non-physical or psychological maltreatment and may include actions by parents or caregivers such as belittling, ridiculing, yelling, blaming, or threatening, among others (Kent, Waller, & Dagnan, 1999). Using this criterion, Kent and Waller (1998) developed a fourth subscale of the CATS using existing items that did not make up the other three subscales. Their emotional abuse subscale was therefore made up of seven items, one of which was also included in the neglect/negative home environment subscale.

5.1.3 Psychophysiological Reactions to Affectively Arousing Stimuli

Extensive research has employed psychophysiological measures (e.g., skin conductance and heart rate) in order to investigate individuals' responses to aversive stimuli. The aim of much of this research is to investigate the somatic consequences of emotional arousal. That is, how stimuli (either pleasant or unpleasant) effects individuals' physiological reactions. These types of studies can then be used to generalise reactions to related stimulus events in individuals' life experiences. For example, Lang, Bradley, and Cuthbert (1997, p. 97) found that "…attention is more likely to be sustained by stimuli that have motivational significance, compared to routine, affectively neutral events." Lang et al. (1997, p. 97) call this an "evolutionary inheritance" in that we as humans receive reinforcement (either positive or negative) when our attention is engaged by meaningful stimuli. Animal studies also provide additional support for the claim that motivationally relevant stimuli will secure attention. It is necessary that an animal be on the lookout not only for predators and other dangers, but also for food and sexual partners (Lang et al., 1997). Thus using pictures of affectively arousing stimuli can provide information as to how we as humans react to related stimuli outside the laboratory. According to Lang et al. (1997), the

physiological reactions evoked by affectively arousing images presented to individuals are "…fundamentally similar to those occurring when organisms stop, look, and listen, sifting through the environmental buzz for cues of danger, social meaning, and incentives to appetite" (p. 98).

Findings from studies measuring the physiological responses to affectively arousing images have made some consistent findings. For example, Lang et al. (1997) claim that one reliable finding is sustained cardiac deceleration during the time period that participants view images containing aversive/negative content. This resembles the phenomenon of "fear bradycardia" which generally occurs in animals where no escape (from a predator or other aversive situation) is possible (Lang et al., 1997). This bradycardic effect reflects vagus (i.e., parasympathetic nervous system) activity. However, research has determined that while exposure to negative imagery results in a slowing of the heart, skin conductance (a measure of sympathetic nervous system reactivity), *increases* with respect to stimulus arousal properties, regardless of whether the image is judged as pleasant or unpleasant (Lang et al., 1997; Lang, Greenwald, Bradley, & Hamm, 1993). Thus affective arousal generates increased activity in both branches of the autonomic nervous system (Lang et al., 1997) and may be considered a physiological measure of vigilance.

Bradley, Cuthbert, and Lang (1996), in a study investigating the effect of creating a sustained affective context (i.e., showing a continuous series of pleasant, neutral, and unpleasant images to participants), found that participants were able to discriminate between affective stimuli within arousing contexts even over extended periods of time. That is, a larger number of skin conductance responses were obtained for images deemed emotionally arousing (either pleasant or unpleasant) compared to neutral images. It is important to know that participants' electrodermal responses will continue to discriminate arousing stimuli from non-arousing stimuli without habituating to the overall affective context created by the experimental design.

In a study examining the autonomic and EEG correlates of emotional imagery in high and low hypnotic susceptible individuals, Sebastiani et al. (2003a) presented participants with a neutral stimulus (i.e., a nonthreatening animal such as butterflies or chicks) and an unpleasant stimulus (i.e., spiders, rats). The experimenters then verbally presented a scenario in which the neutral animal and the unpleasant animal were coming closer to the participant. Prior to each verbal presentation, however, a five minute relaxation instruction was given. Results indicated that

while similar skin conductance trends were exhibited by both the high and low susceptible individuals (i.e., a decrease during the unpleasant stimulus), the heart rates of high susceptible individuals *decreased* in response to the unpleasant stimulus but increased in the low susceptible individuals. Sebastiani et al. (2003a, p. 159) concluded that high susceptible individuals' ability to "buffer or suppress" their autonomic responses lends support to accounts of hypnosis as a dissociative process.

In a study examining autonomic responses to aversive stimuli, Gemignani et al. (2000) supposed that hypnotic induction would be quite effective in regulating the mind-body relationship in people with simple phobia. In this study, the researchers asked five participants (who had been screened for their susceptibility to hypnosis and were all found to have excellent imaginative and attentional abilities based on scores for the various questionnaires employed[13]) to imagine both a neutral mental image and a mental image of their phobic object. In total, six conditions were employed: (a) quiet wakefulness (eyes closed), (b) neutral hypnosis (hypnosis without suggestion, just relaxation, time 1), (c) suggestion of neutral object, (d) neutral hypnosis (time 2), (e) suggestion of phobic object, and (f) neutral hypnosis (time 3). Results of the study found that when thinking of the feared object, both participants' heart rate and respiratory frequency increased, indicating sympathetic predominance during the hypnotic context. In addition, there was an increase in the gamma band of the participants' EEG activity. This was relevant to the aim of their research as gamma activity has been related to numerous processes including those associated with emotional states (see De Pascalis, 1999). Gemignani et al. (2000) thus concluded that certain autonomic nervous system responses to aversive stimuli can also be induced in people by means of hypnotic suggestion. This was revealed in this study in both the structured interview at the conclusion of the experimental procedure (whereby *all* of the participants rated that they felt intense negative emotion after the suggestion for their phobic object with a mean score of 4.8 ± 0.2[14]) and the changes in their heart rate and respiratory frequency (Gemignani et al., 2000). Gemignani et al. (2000) also claim that these observed changes were related to the suggestions received by the participants in each of the conditions and did not depend on the hypnotic state.

---

[13] These questionnaires included the TAS (Tellegen & Atkinson, 1974), the Visual Vividness Imagery Questionnaire, and the Differential Attentional Processes Inventory (as cited in Gemignani et al., 2000).

[14] Participants rated their negative emotion on a scale from 0 (*No fear-like involvement*) to 10 (*Extremely intense fear-like sensation*). In order to avoid a ceiling effect, participants were advised to rate 5 an intense negative emotion "comparable to that usually induced by the presence of the real phobic object" (Gemignani et al., 2000, p. 106).

In a study conducted by Sierra et al. (2002) investigating the autonomic responses of individuals with depersonalisation disorder, a disorder characterised by the dissociation of affective responses, results indicated that exposure to negative images by these individuals led to significantly reduced skin conductance responses compared to the control group who showed significantly higher responses. In addition, the individuals with depersonalisation disorder rated the aversive imagery as less arousing than either the pleasant or neutral images they also viewed. Interestingly, subjective valence ratings did not differ between the groups, indicating that the depersonalisation disorder group was able to make a judgement regarding the emotional meaning of the image. A study conducted by Lang et al. (1993) also found that when images were rated as arousing (either pleasant or unpleasant), participants' skin conductance responses also increased. The findings of these studies and others like them, therefore, lend support to the claims that there are fairly uniform autonomic responses expected to aversive imagery.

5.1.4 The Current Study

The objective of the current study is to examine the relationship of reports of early (childhood) trauma exposure experiences to adult measures of imaginative involvement (absorption and fantasy proneness) and imagery (Betts' QMI), related in Study 2 to the expression of experiential and instrumental mental sets in trance inducing contexts, respectively, as well as to subjective (experiential) and autonomic responses to negative affective stimuli. In the current study, participants viewed a series of aversive images, an experimental method employed by many researchers to investigate the self-regulation of emotional arousal (e.g., Amrhein, Mühlberger, Pauli, & Wiedemann, 2004; Bryant & Kapur, 2006; Lang et al., 1993; Sierra et al., 2002). Participants viewed these images under two conditions: a baseline condition in which they viewed and rated the images, and a trance condition in which they viewed and rated the images following a standardised trance induction procedure. In each condition, participants had both their skin conductance and heart beats continuously recorded as measures of autonomic arousal. The purpose of this paradigm was to safely simulate the witnessing of traumatic events in order to evoke participants' spontaneous self-regulatory responses.

This study proposes to investigate the relationship of recalled childhood trauma on the affective self-regulation responses processes of individuals in a context designed to engage aptitude for dissociative states (trance induction) and a baseline condition. As trait measures of absorption and fantasy proneness (i.e., MODTAS and ICMI) are often found to be quite highly

correlated (>.70; see Lynn & Rhue, 1988), it is often argued that they are essentially alternative measures (Näring & Nijenhuis, 2005). However, with the exception of Näring and Nijenhuis (2005), research on the recall of childhood trauma and adult dissociation has focused on fantasy proneness (i.e., ICMI) rather than absorption, and that study did not directly compare those trait measures in this context. Therefore that comparison will be undertaken here. It was therefore hypothesised that: (a) the measures of absorption ability (i.e., MODTAS; Jamieson, 2005) and fantasy proneness (i.e., ICMI; Hough, 2006; Wilson & Barber, 1983a, 1983b) would be highly positively correlated. Additionally, (b) the MODTAS and (c) the ICMI would both show significant positive relationships with each of the four subtypes of the measure of childhood trauma exposure (i.e., CATS; Kent & Waller, 1998; Sanders & Becker-Lausen, 1995).

While viewing images has demonstrated the ability to "…influence, or even cause, bodily reactions…there are few studies that demonstrate that individual differences in imagery ability influence the magnitude of such effects" (Sheehan et al., 1983, p. 214). Because such evidence is lacking, the current study also aimed to test this relationship. Given that the imagery ability measure (i.e., Betts' QMI; Sheehan, 1967) is scored with high ability receiving low scores, it was further hypothesised that: (d) there would be a significant negative relationship between the Betts' QMI and autonomic responses evoked by viewing affective images.

This study also aims to examine the role that recall of trauma in childhood may have in affective self-regulation in adulthood. Based on the model that abuse in childhood can be regarded as an antecedent to absorption, fantasy proneness, and dissociative abilities in adulthood (Näring & Nijenhuis, 2005), it was hypothesised that following a trance induction: (e) the PCI factor Self-Control (comprising experiences of volition, rationality, and self-awareness) would negatively correlate with the four abuse subtypes, indicating a deficit in the "instrumental" self-regulatory responses of those with recollections of such trauma.

Finally, as noted above, individuals high in trait absorption have been found to be better able to self-regulate autonomic responses when confronted with psychological stressors. Thus the final hypothesis predicted: (f) that there would be a significant positive relationship between the trait of absorption (together with the ICMI) and autonomic nervous system regulation as measured by skin conductance and heart rate responses *but particularly in the trance (or absorption-eliciting) condition.*

5.2 Method

5.2.1 Participants

Data were subsequently collected from 51 participants (28 males, 23 females). Participants ranged in age from 19 to 65 for males (M = 38.89, SD = 14.01) and from 18 to 57 for females (M = 31.35, SD = 12.30). An independent samples t-test determined that there was a just significant difference between males and females in age, $t(49) = 2.02$, $p = .05$, $d = 0.57$.

The majority of the sample (56%) was comprised of university students. Twenty-two percent of participants were identified according to the Australian and New Zealand Standard Classification of Occupations (Australian Bureau of Statistics [ABS], 2009) as Protective Service Workers (i.e., fire-fighters and police officers). Other notable occupations (12%) included those classed by the ABS (2009) as Health and Welfare Support Workers (i.e., ambulance officers) in addition to Midwifery and Nursing Professionals (i.e., registered nurses)

All participants reported normal hearing, normal or corrected to normal vision, and no known psychiatric or neurological problems. Individuals gave written informed consent to participate in the study and were paid $10 for taking part. Human Research Ethics Committee approval was granted for this study.

5.2.2 Materials

5.2.2.1 Self-Report Measures

A series of paper-and-pencil questionnaires were administered to each participant in order to measure their subjective responses. In addition to requesting the participant's age and sex, the questionnaire package employed several different scales designed to measure their absorption, fantasy proneness, ability to image, and phenomenology of consciousness. As well as these measures, participants also completed a measure of their recollections of childhood trauma. Prior to the experimental manipulation, though, participants were screened for their level of psychological distress (see below) with those scoring higher than a predetermined score excluded from further participation.

Psychological distress. Individuals' levels of psychological distress (anxiety and depressive symptoms) were measured using the Kessler Psychological Distress Scale (K10; Kessler & Mroczek, 1994, as cited in Andrews & Slade, 2001). The K10 was developed as a measure of

"non-specific" psychological distress (e.g., Kessler et al., 2002) and contains ten items questioning an individual's experience of different anxiety and depressive symptoms in the previous four week period. Thus the K10 may be regarded as a valid screening tool for the current study. The K10 is measured on a 5-point response scale ranging from 1 (*None of the time*) to 5 (*All of the time*). Participants respond to how frequently, in the past 30 days, they have felt, for example, "…tired out for no good reason", "…hopeless", or "…that everything was an effort". Items are then summed together to achieve an overall score and these scores can range from 10 to 50.

Different researchers have employed differing methods of scoring the K10. The method applied in this study was one developed by the Clinical Research Unit for Anxiety and Depression located at the School of Psychiatry at the University of New South Wales (CRUfAD, 2003). CRUfAD created a triad of cut-off scores indicating the level of risk of developing anxiety or a depressive disorder. These scores are as follows: (a) 10-15, little or no risk; (b) 16-29, medium risk; and (c) 30-50, high risk. Another example of a scoring method is that by Andrews and Slade (2001) who devised their technique to measure how much clinical intervention an individual would require, such that: (a) 10-15, no help; (b) 16-29, self-help; and (c) 30-50, professional help. Other methods have been developed, however, it was decided that those individuals who scored any higher than 30 (as measured by CRUfAD) would progress no further in this study.

Much research has been conducted using the K10 and, as such, it has been found that this measure has high internal consistency. For example, Hides et al. (2007) found that the K10 had a Cronbach's alpha of .84 for their study, but an alpha as high as .93 as also been found (Kessler et al., 2003). The Cronbach's alpha for this sample was a high .83.

Absorption. Participants' absorption levels were again measured using the MODTAS (Jamieson, 2005) as in Study 2. The Cronbach's alpha for this sample was a very high .95.

Fantasy proneness. An individual's level of fantasy proneness was measured using a modified version of the ICMI (Hough, 2006; Wilson & Barber, 1983a, 1983b). The original ICMI was a 52-item questionnaire measured on a dichotomous true or false scale. The version used in this study, however, is based on research by Fellows and Wright (1989) who determined that if a Likert-type scale was employed instead, it would allow individuals to more accurately

report their feelings. Thus the ICMI-Format F (ICMI-F), indicating frequency, with three less items[15] than the original and developed by Hough (2006)[16], is used in this thesis.

The ICMI-F contains 45 items plus four "warm-up" items not scored in the final analysis and is measured on a 5-point Likert scale ranging from 0 (*Never*) to 4 (*Very often*). It measures both Childhood Memories and Present State Imaginings. That is, it asks individuals to rate how frequently certain experiences occurred in childhood (e.g., "When I was a child I lived in a make-believe world", and "When I was a child, I would spend at least half of my waking day imagining") and then how often certain other experiences occur presently (e.g., "As an adult I live in a make-believe world" and "My dreams tend to be at least as vivid as actual life experiences"). Scores can be summed to create a total score ranging from 0 to 180, with the higher the score, the greater the proneness to fantasy and/or imagination (Hutchinson-Phillips, Jamieson, & Gow, 2005). However, based on an exploratory factor analysis first conducted by Klinger, Henning, and Janssen (2009), it is suggested that the ICMI is more factorially complex than previous investigators envisaged. Klinger et al. (2009) found two dimensions (altered consciousness and imagination) in their analysis. Based on Klinger et al.'s (2009) findings, a factor analysis was conducted on their data which revealed three interpretable dimensions (see Appendix A for the details of this analysis). These dimensions are referred to as (with Cronbach's alphas for the current sample): (a) altered awareness ($\alpha = .67$), (b) imagination ($\alpha = .77$), and (c) vivid fantasy ($\alpha = .81$).

Previous research (e.g., Lynn & Rhue, 1986) has suggested that the ICMI has adequate reliability; however, there has been a dearth of information published on the psychometric properties of the original inventory. There is, however, some information on adapted scales to be found. For instance, Myers (1983), who adapted the original ICMI into a children's form (ICMI-C), reported a Kuder-Richardson reliability of .89. In addition, Hough (2006) reported a Cronbach's alpha of .91 for the ICMI-F in his study, but this result was based on only 42 items. Despite this, the Cronbach's alpha for the total current sample was .93.

---

[15] Items 24 ("When I was a child, I would have enjoyed or I did enjoy taking ballet dancing lessons"), 31 ("If I could not imagine anymore, besides other effects it would have on my life, I wouldn't be me anymore – I would be a basically different person"), and 45 ("I have at some time in my life thought I was pregnant and in addition to not menstruating, developed other symptoms of pregnancy [e.g., morning sickness, abdominal enlargement, breast changes, etc.], only to find out later that I was not pregnant").

[16] Brian Fellows sent Hough (2006) a personal communication with this revised version of the ICMI. Hough then rewrote some of the items in order to simplify the wording.

Imagery ability. An individual's capacity to image was again measured using the shortened version of Betts' QMI (Sheehan, 1967) as in Study 2. The internal consistency of this measure for the current sample was a very high .97.

Phenomenological experience. An individual's subjective experience of the experimental manipulation was again measured via the PCI (Pekala, 1991a) as in Studies 1 and 2. As in Study 2, the five major dimensions uncovered in Study 1 were used in this study. The Cronbach's alphas for each dimension for this sample are as follows: (a) Altered Awareness $\alpha = .80$, (b) Negative Affect $\alpha = .87$, (c) Self-Control $\alpha = .74$, (d) Positive Affect $\alpha = .74$ and (e) Imagery $\alpha = .77$.

Childhood trauma. An individual's recollection of trauma or abuse in childhood was examined using the 38-item CAT scale (Sanders & Becker-Lausen, 1995). The CATS is measured on a 5-point Likert scale from 0 (*Never*) to 4 (*Always*) indicating how often each of the listed experiences is recalled to have happened during childhood and adolescence. The original CATS measured the subjective reports of three subtypes of abuse or trauma in childhood, namely neglect or a negative home environment (14 items; e.g., "As a child did you feel unwanted or emotionally neglected?"), sexual abuse (six items; e.g., "Did you have traumatic sexual experiences as a child or teenager?"), and physical abuse or punishment (six items; e.g., "Did your parents ever hit or beat you when you did not expect it?"). An additional subscale named emotional abuse (seven items; e.g., "Did your parents upset you or call you names?") was added by Kent and Waller (1998) in an amendment to the original scale. The scores for each subscale are computed as means of the items that make up that subscale.

The original version of the CATS was found to have adequate reliability and validity with Sanders and Becker-Lausen (1995) calculating the overall alpha as .90. The alphas for the three subscales were .86 (neglect/negative home environment), .76 (sexual abuse), and .63 (physical abuse/punishment). Kent and Waller's (1998) additional subscale of emotional abuse had an alpha of .88 in their study. The alpha for the overall scale for the present study was a very high .94 and for each of the four subscales the alphas were as follows: (a) neglect/negative home environment $\alpha = .87$; (b) sexual abuse $\alpha = .87$; (c) physical abuse/punishment $\alpha = .73$; and (d) emotional abuse $\alpha = .87$.

5.2.2.2 Stimulus materials

Task 1 – Baseline condition. Forty images of real world traumatic and unpleasant scenes were employed in this first part of the study. The majority of these images (*n* = 27; 67.5%) used were selected from the International Affective Picture System (IAPS; Lang et al., 2005), a database of images which was "…developed to provide a set of normative emotional stimuli for experimental investigations of emotion and attention" (Lang et al., 2005, p. 1). Traditionally, the IAPS has been used to research basic processes such as learning, motivation, and attention (Libkuman, Otani, Kern, Viger, & Novak, 2007). However, it is a widely used instrument that has been employed to investigate different processes including, for instance, emotion (e.g., Bryant & Kapur, 2006) and age effects to negative arousal (e.g., Gavazzeni, Wiens, & Fischer, 2008).

The IAPS database rates all images on the dimensions of valence (i.e., pleasantness) and arousal (i.e., level of excitement) on a scale of 1 (low pleasure, low arousal) to 9 (high pleasure, high arousal). Thus the images used in this study were chosen for their low valence and high arousal ratings. The average valence rating for the selected images was 2.16 (*SD* = 1.46), and the average arousal rating was 6.39 (*SD* = 2.18). The remainder of the images used in this Task (*n* = 13; 32.5%), were found from various online sources using an internet search engine and selecting images deemed disturbing or distressing and which also complemented those already selected from the IAPS database (other researchers have also supplemented the IAPS images with additional images from other sources; see e.g., Hamann, Ely, Hoffman, & Kilts, 2002).

The images selected depicted various different scenes and aimed to cover a vast array of what might be perceived as distressing to an individual. As such, examples of these images included scenes representing mutilations, accidents, sick children, physical attacks, hurt animals, and medical scenes. A full list of the images presented to participants and their mean valence and arousal ratings is found in Appendix B.

Task 2 – Trance induction condition. Another 40 images were employed for the second part of this study which was commensurate to those used in Task 1. Again, the majority of the images (*n* = 30; 75%) selected for this task were chosen from the IAPS database, while the remainder (*n* = 10; 25%) came from various online sites.

The average valence rating for the IAPS-selected images was 2.23 (*SD* = 1.48) and the average arousal rating was 6.06 (*SD* = 2.31). A full list of the images presented to participants and their mean valence and arousal ratings is found in Appendix C.

For both image sets (Task 1 and Task 2), the IAPS pictures chosen were matched closely on normative valence and arousal ratings (Lang et al., 2005). A paired samples *t*-test on the valence ratings of these images alone revealed no significant differences between the two sets of images included in this analysis, $t(26) = -.44$, $p = .661$, $d = -0.12$.

Audio material. The audio file based on a script developed by Jamieson (2007) was used to place participants in a positively induced absorption state as in Studies 1 and 2. The full12 minutes 41 seconds version of the audio was presented to participants in this study. The audio was played to participants through a pair of Sennheiser® wired headphones with the volume set at 60 percent of the full volume.

5.2.2.3 Stimulus Creation and Presentation

After the images were selected from either the IAPS database or various online sites, they were modified to a standard size of approximately 425 x 319 pixels for landscape images and approximately 300 x 425 pixels for those presented as portrait. These images were then presented to participants using STIM^2 Gentask (Compumedics Neuroscan, 2003) software on a 41cm Dell computer monitor with participants sitting approximately 125cm from the screen.

Images were randomised using an online list randomiser[17] and then programmed into Stim^2 for presentation to participants. Each image was programmed to be on screen for no longer than six seconds. Between each image presentation, a fixation cross was displayed in the centre of the screen as an interstimulus interval (ISI). The cross was randomised to appear for between 1.5 and 2.5 seconds. The reason for this randomisation was so that participants could not form an expectation of the time it took for each image to appear. Thus they were never sure when the next image would appear on screen.

Prior to the ISI, participants were presented with an intermediate slide requesting them to rate the previous image (on a scale from one to four) indicating how distressing they found it. The

[17] See http://www.random.org/lists/

intermediate slide was presented for five seconds or until participants rated the image before moving on to the ISI and proceeding image (see Figure 5.1).

Figure 5.1. An example of the process of stimulus presentation as seen by participants. First, the image is presented followed by the intermediate response prompt slide ("Please rate the previous image now") and the ISI (+). Following the ISI, the next image in the array appears. In addition, the time each slide was seen on screen before moving on to the next slide is also indicated.

5.2.3 Psychophysiological Data Acquisition

Skin conductance. For the current study, an analysis of the reaction of individuals' electrodermal activity was conducted. Electrodermal activity may be regarded as the body's response to various emotional states including stress or arousal. Stern, Ray, and Quigley (2001, p. 206) state that it is a measure of an "…organism's interaction with its environment." Electrodermal activity is also related to the body's sweat gland activity. For the purposes of this study, skin conductance was selected for several reasons. First, conductance values are more suitable for statistical manipulation as they are more normally distributed than resistance values. A second reason is that conductance increases with higher levels of arousal or emotion and decreases at low levels (Andreassi, 2007). This relationship makes presentation and interpretation of results more intuitive for many people.

Following stimulus onset, the typical latency period for the skin conductance response (SCR) is about one to three seconds. This is defined as the temporal interval between stimulus onset and SCR initiation. This period is typically referred to as rise time. Skin conductance is a relatively

slow moving response with the interval between the skin conductance peak and point of 50 percent recovery of the SCR amplitude taking between two and ten seconds (Stern et al., 2001).

Skin conductance measures sympathetic arousal and thus is under the auspices of the autonomic nervous system (ANS). The general role of the ANS is to influence visceral activities, thus it is also referred to as the visceral motor system. It regulates smooth muscle (such as that found in the skin and eyes), cardiac muscle, and glands. The sympathetic nervous system is responsible for enabling the activities that are mobilised during emergency and stress situations (the "fight or flight" response) and any other activity that requires an expenditure of energy. For instance, when required, the sympathetic system enervates the heartbeat, stimulates glucose release in the liver, and stimulates sweating (Carlson, 2002). Thus it is this latter activity that is examined in skin conductance.

There are two types of sweat gland in the human body: the apocrine and the eccrine. The apocrine are large glands that open in hair follicles and are found in the genital areas and armpits (Andreassi, 2007). Generally, they are of little interest in the study of psychophysiology. The eccrine glands, on the other hand, are of more interest. They are distributed widely across the body and are found almost everywhere (exclusions include the lips and outer ear among others; Andreassi, 2007). However, they are most numerous on the palms of the hand and soles of the feet and thus are the sweat glands of interest for measuring skin conductance as sweating may be more easily provoked in these areas.

Thus while participants were viewing the negative imagery presented to them on the computer monitor as previously specified, skin conductance data were collected using a BIOPAC MP100 data acquisition unit and GSR 100C amplifier module (BIOPAC Systems Inc, 2001). The 100C amplifier uses the constant voltage method to measure skin conductance in micro-mho (μmho) or micro-siemen (μS) units[18]. The constant voltage method, according to Andreassi (2007), holds the voltage across electrodes constant and the current that passes through the skin varies with conductance changes. Thus larger values equate to higher levels of conductivity and smaller values less conductivity. Skin conductance was transduced using TSD203 silver/silver chloride electrodes attached with a Velcro® strap to the volar surface of the medial phalanges of the left hand with Signa Gel, an electrolyte conductive gel with a 0.5 percent saline base. Venables and

[18] In practice, skin conductance may be expressed in either μmho or μS units. In order to maintain consistency, however, the newer term, μS, will be used here.

Christie (1973, as cited in Andreassi, 2007) recommend that electrodes be placed on two adjacent fingers as this allows recording from fingers innervated by the same spinal nerve.

Figure 5.2 indicates the placement sites used for the electrodes recording electrodermal activity in this study.

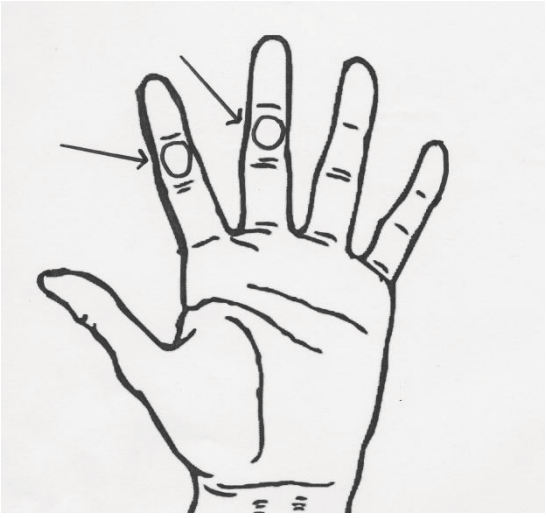

Figure 5.2. Electrodes were placed on the volar surfaces of the medial phalanges of the left hand for the recording of electrodermal activity.

The skin conductance data were recorded using Acq*Knowledge* 3.7.4 software (BIOPAC Systems Inc, 2001) at a sampling rate of 200 samples per second.

Heart rate variability. In addition to electrodermal activity, participants' heart rate variability (HRV) was measured using a method known as photoplethysmography (PPG). HRV refers to the beat-to-beat alterations in heart rate. It is a reliable measure of the interaction between sympathetic and parasympathetic (i.e., associated with functions that occur during a relaxed state and reflects the conservation and restoration of energy; Carlson, 2002) nervous system activity in autonomic functioning (Gaudiano, 2000). HRV is typically derived from the successive inter-beat R-R intervals (i.e., the time duration between two consecutive R waves) of electrocardiography (ECG; Selvaraj, Jaryal, Santhosh, Deepak, & Anand, 2008). While HRV is generally obtained via ECG, PPG is a non-invasive method used to monitor arterial oxygen saturation via a pulse oximeter (Lu et al., 2008). Pulse oximetry measures the oxygen saturation

of a person's haemoglobin and the changes in blood volume in the skin (Fearnley, 1995). This produces a photoplethsmograph. PPG is already widely used in medical environments for the purpose of monitoring patients' heart rates and cardiac cycles or those under anaesthesia (Lu et al., 2008).

Some researchers have already asked the question whether PPG may be used as an alternative approach to obtain HRV information (e.g., Lu et al., 2008; Selvaraj et al., 2008). The consensus appears to be that it can. For instance, Selvaraj et al. (2008) conducted a study comparing PPG and ECG on ten healthy participants. The researchers found that there was a high correlation ($r = 0.87 \pm 0.19$) between the ECG-derived R-R intervals and the PPG-derived peak-to-peak (P-P) intervals. While the two signals were not identical, the researchers found that the differences between the two were negligible. Likewise, Lu et al. (2008), comparing the time and frequency domain parameters of HRV with that of PPG variability (PPGV), found there was a high correlation between the two signals ($p < .001$). Thus Lu et al. (2008) concluded that PPGV could be used as an alternative measurement of HRV.

The question may still be raised, even given the above research, as to why PPG would be used over ECG. One reason is that it is possible for some individuals to manipulate their heart rate and so while ECG is a more familiar measure, this could happen under experimental conditions. However, with PPG, the electrode is generally attached to either a single finger or the earlobe, thus making manipulation of the signal a much more unlikely proposition. Another reason for choosing PPG over ECG is the use of a single electrode. This makes it a far less invasive procedure compared with ECG which may employ multiple electrodes. Finally, as the above research has discovered, PPG achieves the same outcome as ECG and in a far less intrusive manner.

Frequency domain analysis, a typical procedure used to analyse HRV, "…describes the periodic oscillations of the heart rate signal decomposed at different frequencies" (Sztajzel, 2004). This is conventionally parsed into high frequency (HF; 0.15 - 0.40 Hz) and low frequency (LF; 0.04 – 0.15 Hz) power values. HF occurs simultaneously with adult respiration and is associated primarily with parasympathetic activity (Appelhans & Luecken, 2006; Kawachi, 1997). LF, on the other hand, is more complex. Some researchers regard LF as being modulated by both sympathetic and parasympathetic nervous systems (e.g., Kawachi, 1997; Sztajzel, 2004).

Generally, though, the consensus is that LF is typically associated with sympathetic activity (e.g., Sztajzel, 2004).

While participants were viewing negative affective images, heart rate data were collected using a BIOPAC 100C photoplethysmogram amplifier module and a TSD200 transducer (BIOPAC Systems Inc, 2001). The TSD200 consists of a matched infrared emitter of wavelength 860 ± 6 nanometres and photo diode which transmits variations in blood density caused by varying blood pressure (BIOPAC Systems Inc, 2001). The single electrode was attached distally to the volar surface of the fourth finger of the left hand using a Velcro® strap. When attached to the finger, the reflected infrared light was modulated by the density of red blood cells pulsing through the tissue below. The reflected light resulted in small changes in the resistance of the photo resistor, which conferred a proportional change in voltage output (BIOPAC Systems Inc, 2001).

As with the skin conductance data, the heart rate data were recorded using Acq*Knowledge* 3.7.4 software (BIOPAC Systems Inc, 2001) with signals again recorded at a sampling rate of 200 samples per second.

5.2.4 Procedure

Participants were met at the laboratory by the researcher and asked to read an information sheet outlining the aims and procedure of the study in addition to containing the researcher's contact details should they wish to find out the results of the study once they became available. Participants then signed a consent form agreeing to have their heart rate and skin conductance responses recorded whilst viewing negative affective images. After this, each participant completed the K10 (Kessler et al., 2002). Scores 30 and below (i.e., not at an extreme risk for developing anxiety and/or depression) meant that the participant would be able to proceed[19].

After completing the forms, participants were invited to move into an inner room where the testing would take place and to make themselves comfortable. Once seated, they were presented with the larger questionnaire package containing the MODTAS (Jamieson, 2005), the ICMI-F (Fellows & Wright, 1989; Hough, 2006), and the Betts' QMI (Sheehan, 1967). At the completion of the questionnaire package, participants were informed that the skin of the volar surfaces of the medial phalanges of the second and third fingers of their left hand would be prepared in order to

[19] No participants were excluded based on their K10 scores.

enable recording of their heart rate. In addition, the distal phalanx of the fourth finger on the same hand was likewise prepared to record skin conductance. The skin was exfoliated with NuPrep®, an abrasive gel designed to reduce skin impedance, and then wiped with a cotton wool ball dipped in a rubbing alcohol. Once the electrodes were attached, participants were asked to keep their hand as still as possible in order to minimise movement artefacts based on the sensitivity of the equipment.

At the beginning of the baseline task, a computer keyboard on a piece of board was placed across the participant's chair above their lap. Participants were then informed about the nature of the first part of the experimental task. They were told that on the computer screen in front of them they were going to see a series of images. To begin, they would see an instruction screen informing them that: "The following is a series of images. You are asked to view these images and rate how distressing you find them on a scale of 1 (Low distress) to 4 (Extremely distressing). When prompted, and as quickly as possible, please enter your rating using the right-hand keypad." In other words, participants were required to rate how arousing they found each of the images. The researcher also placed a printed page, reminding the participant about the rating scale, on the board alongside the keyboard. Participants were then told that after the instruction screen they would see the first image appear which would remain on screen for six seconds. Participants were advised not to make a rating, though, until the image disappeared and another, interval screen, appeared informing them to now make their rating. After rating the image, a fixation cross appeared on screen which was then followed by another image. Participants were told the entire procedure would take approximately nine minutes and that even though they were making movements in order to make key presses when rating the images, all other movement was to be kept to a minimum.

After completing the first task (the baseline condition), participants were told that they were going to have a break from viewing and rating negative images. They were told that there was going to be an intervening task which involved simply watching a series of faces with different emotional expressions. Prior to this, though, participants completed the CATS (Sanders & Becker-Lausen, 1995). This task took approximately six minutes to complete and is not reported further.

At the completion of this task, participants were informed that they were going to listen to an audio file and to make themselves comfortable. The researcher then fitted the participant with

headphones. The audio was divided into two sections. The first part ran for 10 minutes, 50 seconds and participants simply had to sit still and listen to the audio's instructions. After this, the researcher came back into the room and participants completed part two of the experimental task (i.e., the trance induction condition) which, except for the administration of the trance induction, was identical in procedure to part one. Participants' psychophysiological responses were recorded during this second task which again ran for approximately nine minutes. When the task was completed, the audio was run for the remaining one minute, 51 seconds. At the end of the audio, participants were presented with a copy of the PCI (Pekala, 1991a). They were asked to complete it in relation only to the time they were *listening to the audio*, and *not* when they were completing the experimental task.

Once the participant had completed the PCI, the experiment was complete. The researcher carefully removed the headphones and the BIOPAC electrodes from the participant's left hand and thanked them for their time and assistance. The entire experimental process took up to two hours.

5.2.5 Heart Rate and Skin Conductance Analysis

Prior to running the statistical analysis, both the heart rate and skin conductance data were processed and cleaned. R-R intervals of the heart rate data were calculated post-processing by transforming the raw data from volts to milliseconds. Following this, the data (intervals of approximately nine minutes' duration) were subjected to a Fast Fourier Transform (FFT), a method of calculating spectral power density (Leong, Mann, Wallymahmed, MacFarlane, & Wilding, 2000), in order to identify the LF and HF bands in both the baseline and trance conditions.

Raw skin conductance data across both conditions (i.e., baseline and trance induction) was filtered (low pass 8 Hz, 50 taps) and scaled up by 100. To control for individual differences in response magnitude, data were standardised with these values then scaled up by 10. Skin conductance data were then baseline corrected from the initial point (0 milliseconds) of the presentation of stimuli. The data measuring responses to the stimuli (1, 2, 3, or 4) were then epoched from 0 milliseconds to 6000 milliseconds and the means and areas under the curve extracted. Finally, the mean skin conductance values were averaged across the entire stimulus set

for both the baseline and trance induction tasks in order to calculate an average SCR score for each participant in each condition.

5.3 Results

5.3.1 Descriptive Statistics

The means, standard deviations, and range of scores for the questionnaire variables are presented in Table 5.1. One participant scored 30 (i.e., the cut-off score) on the K10 screening measure. However, after discussing this result with the individual, they were unhesitating in their intention to continue with the study.

Examination of the psychophysiological output revealed three participants missing data on the skin conductance responses. Two participants were missing data on the low frequency component of the heart rate data in the baseline condition with one participant missing data in both the low and high frequency components of the trance induction condition. Rather than imputing the missing values, these individuals were simply excluded from these analyses.

Table 5.1

Means, Standard Deviations, and Range of Scores for the Questionnaire Variables (N = 51)

Variables	Mean	*SD*	Potential Range of Scores	Actual Range of Scores
K10	14.45	4.54	10 – 50	10 – 30
MODTAS	53.10	24.83	0 – 136	0 – 120
ICMI-F	58.90	24.74	0 – 180	5 – 134
Altered state (ICMI-F)	10.39	5.49	0 – 40	0 – 26
Imagination (ICMI-F)	13.53	5.79	0 – 32	1 – 32
Vivid fantasy (ICMI-F)	11.20	6.16	0 – 40	0 – 26
Betts' QMI	85.63	31.94	35 – 235	35 – 183
Altered awareness (PCI)	26.92	15.22	0 – 126	0 – 66
Negative affect (PCI)	7.76	10.17	0 – 48	0 – 42
Self-control (PCI)	51.00	12.84	0 – 84	22 – 72
Positive affect (PCI)	8.63	7.54	0 – 36	0 – 30
Imagery (PCI)	10.53	5.25	0 – 24	0 – 22
Emotional abuse (CATS)	1.28	0.77	-	-
Neglect (CATS)	1.24	0.73	-	-
Physical abuse (CATS)	1.35	0.74	-	-
Sexual abuse (CATS)	0.16	0.52	-	-

Note. The ranges of scores are not presented for the CATS subscales as each total is comprised of the mean scores of the items that make up that subscale.

5.3.2 Bivariate Correlation Analyses

Bivariate correlation analyses were conducted to assess the size and direction of the linear relationship between the questionnaire measures and psychophysiological measures in order to test the listed hypotheses. The results of these analyses are found in Table 5.2. Prior to running these analyses, however, assumption testing revealed that the low and high frequency components of HRV were found to have violated normality. A square-root transformation was applied; however, this did not rectify the violation so a logarithm transformation was then applied which corrected the normality problem. Analyses were then run with both the transformed and raw data. Results indicated that there was no difference between the transformed and raw data, so

in the interest of interpretability (see Tabachnick & Fidell, 2001), the raw data results are presented for these and all future analyses. It is also worth noting that both sex and age were included in these analyses, however, as they are not the focus of this research (and revealed no pertinent significant findings), the results are not reported.

The first hypothesis stating that there would be a large positive relationship between MODTAS and the ICMI-F (total score and three fantasy subtypes) was supported with all r values $p < .001$. Thus this result supports previous claims of a strong relationship between absorption and fantasy proneness.

The second hypothesis predicting significant positive relationships between the MODTAS (Jamieson, 2005) and CATS (Sanders & Becker-Lausen, 1995) abuse subtypes was not supported with all correlations being both small in magnitude and nonsignificant (see Table 5.2). Contrary to expectations, absorption ability was unrelated to later recollections of childhood trauma. However, partial support was obtained for the third hypothesis predicting a significant positive relationship between the ICMI-F (Fellows & Wright, 1989; Hough, 2006) and the CATS subtypes. Emotional abuse ($p < .01$) and neglect ($p < .05$), but not physical abuse or sexual abuse, were significantly positively correlated with the total ICMI-F score. Interestingly, the only ICMI-F subscale to have a relationship with any of the abuse subtypes was imagination, significantly correlating with emotional abuse ($p < .05$).

The fourth hypothesis stating that there would be a significant negative relationship between the Betts' QMI (Sheehan, 1967) and psychophysiological measures of autonomic response was not supported with all relevant correlations being small in magnitude and nonsignificant (see Table 5.2). Although not predicted, the Betts' QMI was found to be significantly *positively* correlated with both neglect and physical abuse (both p values $< .05$). This finding indicates that the more neglect or physical abuse recollected in childhood, the *poorer* an individual's ability to form vivid images, when instructed, in adulthood.

The fifth hypothesis stated that there would be a negative relationship between the PCI factor of Self-Control and the four abuse subtypes indicating a deficit in the self-regulatory capacities of those reporting exposure to childhood trauma. This hypothesis was only partially supported with Self-Control correlating with two of the reported abuse subtypes, neglect ($p < .05$) and physical

abuse ($p < .01$) indicating that the more either of these types of abuse were recalled, the lower the individual's experience of being in volitional control following the trance induction.

The final set of hypotheses predicted that there would be a significant relationship between the traits of absorption and fantasy proneness, respectively, and autonomic nervous system regulation (as indexed by the HRV and skin conductance responses) during exposure to distressing images but particularly in the trance condition. Results found a significant negative relationship between the MODTAS and skin conductance responses in the trance induction condition, indicating that greater absorption ability is related to a greater reduction in skin conductance following trance induction. This, however, was the only significant relevant result for the MODTAS. Fantasy proneness was also found to significantly negatively correlate with skin conductance responses in the trance condition with the largest relationship being the ICMI-F dimension (factor) of altered state ($r = -.41$). Additionally, fantasy proneness (total score and vivid fantasy dimension) was significantly positively associated with parasympathetic regulation of heart rate as measured by the high frequency component of HRV in the trance condition. The total ICMI-F score as well as all three fantasy factors were also all positively correlated with sympathetic regulation of heart rate as measured by the low frequency component of HRV in the trance condition. These results indicate a significant relationship between multiple aspects of autonomic self-regulation in the trance condition for those high in fantasy proneness.

Table 5.2

Bivariate Correlations among the Major Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. MODTAS	-																			
2. ICMI-F	**.85*****	-																		
3. Altered state (ICMI-F)	**.73*****	**.84*****	-																	
4. Imagination (ICMI-F)	**.58*****	**.79*****	**.51*****	-																
5. Vivid fantasy (ICMI-F)	**.78*****	**.90*****	**.75*****	**.63*****	-															
6. Betts' QMI	-.17	-.16	-.18	-.20	-.20	-														
7. Altered awareness (PCI)	.19	**.34***	.24	.27	**.36****	.17	-													
8. Negative affect (PCI)	-.21	-.20	-.17	-.21	-.20	.44**	.21	-												
9. Self-control (PCI)	.10	.06	.06	.02	.21	**-.36***	-.43**	-.22	-											
10. Positive affect (PCI)	-.06	-.00	.05	.01	.09	.17	.72***	.33*	-.23	-										
11. Imagery (PCI)	.09	.11	.10	.06	.17	.01	.48***	.07	-.04	.44*	-									
12. Emotional abuse (CATS)	.18	**.38****	.16	**.31***	.27	.19	.14	-.03	-.21	-.07	.12	-								
13. Neglect (CATS)	.20	**.34***	.22	.21	.16	**.29***	.15	-.05	**-.27***	-.02	.15	.77***	-							
14. Physical abuse (CATS)	.05	.14	-.04	.10	-.01	**.29***	.20	.02	**-.37****	-.01	.24	.67***	.65***	-						
15. Sexual abuse (CATS)	-.03	.15	.10	.12	.07	.25	.13	-.12	-.20	.03	.19	.37*	.39**	.25	-					
16. HF (Baseline)	-.07	.04	.01	.04	-.02	.01	-.17	.01	.06	-.18	.06	.21	.21	.07	.22	-				
17. LF (Baseline)	-.06	.01	-.00	.03	-.02	-.07	-.16	.01	.11	-.15	.11	.11	.19	-.00	.15	.91***	-			
18. HF (Trance)	.06	**.31***	.23	.24	**.29***	-.04	.23	-.05	-.04	.12	.06	**.38****	.18	.10	**.42****	.26	.11	-		
19. LF (Trance)	.14	**.39****	**.35***	**.30***	**.37****	-.03	.26	.05	-.01	.14	.11	**.29***	.14	.02	**.42****	.21	.08	.93***	-	
20. SCR (Baseline)	-.22	-.16	-.25	-.08	-.06	.06	.08	-.19	-.10	.05	-.16	.01	.06	-.09	.01	-.12	-.11	.07	-.02	-
21. SCR (Trance)	**-.31***	**-.31***	**-.41****	-.16	**-.32***	-.05	-.04	-.10	-.11	-.01	.15	.07	.17	.09	.13	.03	.07	-.04	-.12	.69***

Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$
HF = High Frequency, LF = Low Frequency, SCR = Skin conductance response.

5.4 Discussion

The current study aimed to examine the relationship of recollections of childhood trauma on the processes engaged to control negative affective responses to distressing images in a sample of adults. Firstly, this study investigated the relationship between recollections of childhood abuse and mistreatment and adults' absorption, fantasy, and vivid imaging abilities. Additionally, this study examined the impact of dissociative states on individuals' experience of self-control and autonomic self-regulation processes utilising a standardised trance induction condition. Participants viewed a series of distressing images from the IAPS database (Lang et al., 2005) under two conditions: the first, a baseline condition, and the second, following a trance induction designed to elicit a state of absorption in self-generated imaging. Whilst viewing and rating these images based on how distressing they experienced them to be, participants' psychophysiological responses (i.e., skin conductance and heart rate) were obtained as a measure of their regulation of autonomic arousal. Results indicate that the recall of emotional abuse and neglect in childhood is directly related to fantasy proneness. The recollection of childhood neglect and physical abuse was inversely related both to the level of conscious self-control experienced during trance induction and to imaging ability. Heart rate variability during stimulus exposure was positively related to recollections of childhood sexual and emotional abuse.

5.4.1 The Relationship between Absorption and Fantasy Proneness

The first finding from this analysis replicates findings in the literature which states that absorption ability and fantasy proneness are closely associated (e.g., Braffman & Kirsch, 1999; Lynn & Rhue, 1986, 1988). In the current study the measure of absorption ability, the MODTAS (Jamieson, 2005) and the measure of fantasy proneness, the ICMI-F (and its sub-dimensions; Fellows & Wright, 1989; Hough, 2006) revealed a strong positive relationship ($r = .85$) for the total score and the sub-dimensions (r values between .58 and.78). Therefore 72 percent of the variability in absorption ability can be accounted for by variability in fantasy proneness and between about 34 percent and 61 percent in the fantasy proneness sub-dimensions. These results are congruent with previous research which states that the two instruments seem to be measuring very similar, if not identical, constructs. Despite this finding, present results highlight important (and unexpected) differences between the constructs measured by the MODTAS and ICMI-F in relation to trauma, dissociation, and self-regulation.

5.4.2 Absorption, Fantasy Proneness, and Recollections of Childhood Trauma

Based on previous research which investigated the antecedents of imaginative involvement and fantasy proneness and which considered mistreatment in childhood to be a likely contributor (e.g., Hilgard, 1970, 1974; Lynn & Rhue, 1988; Rhue & Lynn, 1987; Wilson & Barber, 1983a, 1983b), the current study also predicted that absorption ability and fantasy proneness would be positively correlated with all four subtypes (i.e., emotional abuse, neglect, physical abuse, and sexual abuse) of the self-report abuse measure employed (i.e., CATS; Sanders & Becker-Lausen, 1995). Part of the rationale for this hypothesis emanated from research investigating the relationship between dissociation and the experience of traumatic events in childhood (e.g., Näring & Nijenhuis, 2005). Many investigators, such as Näring and Nijenhuis (2005) and Pekala et al. (2001), for instance, have used the DES (Bernstein & Putnam, 1986), a trait instrument, as a measure of dissociation in their studies. In the current study, however, dissociation was measured as an active process indexed in the phenomenological state elicited by a trance induction procedure.

The results of the current analysis did not support the contention that a relationship would exist between absorption ability and the four recalled abuse subtypes with all relationships being small and nonsignificant. However, a positive relationship between fantasy proneness and the recall of abuse in childhood was partially supported with the total ICMI-F score significantly correlating with both recalled emotional abuse and neglect (r = .38 and r = .34, respectively). Thus fantasy proneness accounted for 14 percent of the variability in emotional abuse and almost 12 percent of the variability in neglect. Additionally, only the ICMI-F dimension imagination had a significant positive relationship with any of the abuse subtypes (i.e., emotional abuse) indicating that high imagination use is related to the recalled experience of psychological mistreatment in childhood. Overall, this is an unexpected result which challenges the simple claim that either exposure to trauma leads to the development of traits which underlie the capacity for dissociation or that these traits themselves underpin the experience of victimisation and trauma (Giesbrecht et al., 2008; Näring & Nijenhuis, 2005). Rather, the results indicate that only certain types of recalled trauma (i.e., emotional abuse and neglect) are associated with specific dissociation related traits (i.e., fantasy proneness but not absorption). This result was entirely unexpected given the strength of previous (and current) findings of the magnitude of the relationship between absorption and fantasy proneness. Lynn and Rhue (1986) even claimed that

the ICMI lacked discriminant validity because of the large correlations (commonly in excess of .70 and replicated here) between it and the TAS (Tellegen & Atkinson, 1974). It seems that in this study, the ICMI-F and the MODTAS are *not* measuring exactly the same thing. While these two concepts are highly correlated, the ICMI-F (and its imagination dimension) seems to be tapping into aspects of awareness that the MODTAS does not, specifically those related to recollections of emotional abuse and neglect in childhood.

Giesbrecht et al. (2008) propose that those individuals high in fantasy proneness are apt to confuse imagined events with factual autobiographical memories. That is, to "remember" some event (i.e., childhood abuse) which did not occur. This is a logically consistent hypothesis which requires systematic research to fully evaluate. While we may wish to presume that because an individual is high in fantasy ability they are not necessarily prone to confabulation, research has drawn attention to the possibility that these individuals are given to experiencing pseudomemories as well as a tendency to exhibit a positive response bias on retrospective trauma questionnaires (e.g., Giesbrecht et al., 2008; Pekala et al., 1999-2000). This realisation that those high in fantasy proneness may experience their imaginings with a heightened sense of reality, "as real as real" was first reported by Wilson and Barber (1983a, p. 340) who found in their sample that 85 percent of their fantasisers claimed that they "…tend[ed] to confuse their *memories* of their fantasies with their *memories* of actual events" (p. 353). While this concern amongst researchers is important, one way this relationship can be tested is by collecting and assessing independent reports (e.g., from doctors, relatives, etc.) and objective evidence that may verify whether the recalled abuse actually occurred.

5.4.3 The Role of "Instrumental" Imagery Ability

The fourth hypothesis of a relationship between the Betts QMI (Sheehan, 1967) and the psychophysiological measures of autonomic arousal (i.e., HRV and skin conductance) was not supported with only small, nonsignificant correlations being obtained. As in Study 2, the Betts' QMI had a significant negative correlation (lower scores indicate more vivid images) with the PCI factor Self-Control (r = -.36) supporting its previous interpretation as an "instrumental" (i.e., instructed) imaging ability measure closely tied to the "instrumental set." Unexpectedly, the present analysis uncovered a significant *positive* relationship between the Betts' QMI and the recollection of neglect and physical abuse (r = .29 for each). This result indicates that the more neglectful and physically punitive an individual's recollection of early attachment figures were

recalled to be, the poorer was their ability to form vivid images when instructed to do so by another in adulthood.

5.4.4 The Relationship between Self-Control and Reports of Childhood Trauma

The fifth hypothesis examined the relationship between participants' recollection of childhood trauma and their utilisation of conscious self-control in adulthood as measured by the PCI (Pekala, 1991a). Results revealed that those with recollections of childhood neglect and physical abuse appear to show specific differences in their experience of conscious self-control associated with dissociation. The more these types of abuse were recalled in childhood, the less able are these adults experience conscious self-control (i.e., volition, rationality, self-awareness) during trance induction. This result is further supported by the finding that Self-Control was negatively correlated with Altered Awareness ($r = -.43$, $p < .01$), a PCI trance factor associated with a manifest alteration in an individual's perception of body image, time, perception, and attention (paradigmatic dissociative experiences).

Interesting, too, was the result indicating a significant relationship between self-control and imagery ability ($r = -.36$, $p < .01$). This result provides additional support for that reported in Chapter 4 which found that the lower the Betts' QMI score (signifying *greater* imagery ability), the more Self-Control the individual experienced during a trance induction.

5.4.5 The Relationship between Autonomic Self-Regulation and Absorption and Fantasy Proneness

The final set of hypotheses examined the relationship between the traits of absorption and fantasy proneness and individuals' abilities to self-regulate autonomic responses in two conditions. The first condition (baseline) involved individuals viewing and rating a series of distressing images. The second condition, however, involved participants being administered a trance induction instruction and viewing and rating a comparable series of images. Lang et al. (1997) found that individuals high in trait absorption were better able to self-regulate autonomic responses when presented with psychological stressors. The results of the current study lend support to this previous research with absorption and fantasy proneness both being related to significantly reduced skin conductance responses in the trance condition. However, this was the only such result for trait absorption. Fantasy proneness was additionally found to have a significant relationship with autonomic regulation of heart rate in the trance (dissociation) state

condition. The total ICMI-F score moderately positively correlated with both the HF and LF components ($r = .31$ and $r = .39$, respectively) in the trance condition indicating that fantasy proneness enables individuals to modulate their somatic responses to the distressing images by increasing both their parasympathetic arousal (i.e., greater power in the HF band) and sympathetic arousal (i.e., greater power in the LF band) following a trance induction. The three fantasy dimensions also moderately positively correlated with the LF components with vivid fantasy also correlating significantly with the HF component. This result is comparable to Zachariae et al.'s (2000) findings that absorption ability modulates exposure to a stressor by increasing individuals' sympathetic reactivity. Zachariae et al. (2000, p. 397) also note that this increase in sympathetic reactivity is balanced with a "counter-regulatory increase" in parasympathetic activity as well.

5.4.6 Limitations

The current study used a correlational design, thus causal relationships between the variables can only be inferred. While the sample was modest ($N = 51$ maximum), this is partly attributable to the inherent demands of psychophysiological recording. It is often difficult to recruit participants for several reasons. First, such research may be perceived as intrusive as it involves investigating participants' actual physiological responses. Second, such data collection often takes a greater amount of time to collect. Finally, unlike questionnaires which people can complete anytime either in hard copy or online, physiological data collection requires participants to be present in the laboratory which can be difficult to arrange. As such, due to the limited sample size in the present study, the results of these analyses may not be conclusive and so future research may try to ensure a greater number of participants are recruited. However, the finding of highly significant correlations in a sample of this size also suggests the presence of strong effects within the data.

While many of the relationships reported are the subject of a priori predictions, a number of findings are reported that while a posteriori, are seen to be consistent with the prior conceptual framework. Many of the latter are highly significant (at the level of $p < .01$ or higher), but several are reported at the level of $p < .05$. Given the multiple correlations calculated and their unpredicted nature, this significance level should be interpreted with caution. These particular results certainly require replication before being accepted; however, the coherent pattern which

they form in conjunction with other findings is compelling and warrants careful consideration by those in the field.

Another limitation which was touched upon earlier concerns the fact that the study relied on the retrospective self-report of traumatic events in childhood (i.e., via the CATS questionnaire). The problem is that participants are relying on their memory for the events and as discussed by researchers such as Pekala et al. (1999-2000), those high in fantasy ability may have deficits in the ability to distinguish real from imagined events. This is echoed by Merckelbach and Muris (2001) who claim that certain traits such as hypnotic suggestibility or fantasy proneness may attenuate the accuracy of self-reports of childhood trauma. Brewin, Andrews, and Gotlib (1993) have previously criticised retrospective self-reports by raising certain objections including: (a) that memory is limited in its recall of childhood events; (b) that deficits in memory may exist due to psychopathology (e.g., depression or anxiety may affect recall); and (c) that retrieval biases may also exist because of an individual's mood (e.g., depressed individuals are more likely to recall negative events relative to non-depressed individuals).

Finally, the baseline and trance conditions in this study were not counterbalanced across all participants. Thus the results obtained with respect to the relationship between emotional abuse and HF and LF in the trance induction condition (r = .38 and r = .29, respectively) and between sexual abuse and the HF and LF also in the trance induction condition (in both cases r = .42) may be influenced by order effects. The design required participants to complete the CATS shortly before they were administered the trance induction and may have influenced this result. We cannot rule out the possibility that the act of filling out the questionnaire may have influenced this relationship. Future research will need to ensure that these conditions are fully counterbalanced in order to resolve this issue.

5.4.7 Conclusion

Overall, the current study demonstrates support for the contention that some (but not all) recollections of abuse in childhood have a direct relationship to fantasy proneness in adulthood, albeit without resolving the question of whether childhood abuse and trauma has fostered the development of adult fantasy proneness or whether fantasy proneness is a prior trait contributing to the recollection of such trauma. Verification of reported abuse is essential to further research on this issue. The finding that childhood emotional abuse and neglect but not sexual and physical

abuse are related to adult fantasy proneness provides a challenge for both scenarios in their present form.

This study provided further support for the proposal that trance states may serve as a model of some aspects of dissociation. Results demonstrating different patterns of associations between the trait measures of absorption and fantasy proneness and psychophysiological responses (i.e., skin conductance and heart rate) in baseline and trance conditions support the existence of distinct trance-related pathways in the regulation of autonomic responses. Fantasy proneness and absorption, previously suggested to provide psychological defences mechanisms in the face of trauma (e.g., Lynn & Rhue, 1988), were associated with enhanced self-regulation of autonomic responses in the face of distressing images in the trance but not baseline condition. This finding indicates that trance states and, by inference, dissociation, can play a role (in susceptible individuals) in the modulation of emotional and somatic responses caused by witnessing traumatic scenes.

CHAPTER 6

STUDY 4

6.1 Introduction

In Study 3, the associations between trait measures of absorption, fantasy, and imagery, state measures of phenomenology of experience in a trance condition, and recollections of childhood trauma were examined in relation to the self-regulation processes engaged by individuals, as measured by the psychophysiological parameters of skin conductance and heart rate variability (HRV), in response to viewing images of a highly traumatic nature. In that study, one combined sample of 51 participants was examined in two conditions. In the first (i.e., baseline), participants viewed a series of aversive images which they rated according to how distressing they judged them to be. In the second (i.e., trance induction), participants listened to an audio designed to elicit a state of absorption in inner-generated imaginings. Following the audio, participants were required to view another set of aversive images and rate their subjective distress while endeavouring to maintain the same state of mind.

The current study sought to examine the impact of adult (as distinct from childhood) exposure to traumatic events on the role of dissociation in the self-regulation of responses to witnessing images of traumatic scenes. In the current study, baseline and trance induction conditions were used to manipulate state dissociation (measured through the Phenomenology of Consciousness Inventory [PCI; Pekala, 1991a] factors Altered Awareness and Self-Control). The combined sample used to study the impact of recalled childhood trauma on adult psychophysiological self-regulation was divided into two groups – one a general sample of individuals selected from a predominantly university student population, and the other a sample of individuals selected based on their adult occupational exposure to trauma. Thus, the current paradigm applies the logic of the previous chapter to consider the effects of the adult experiences of trauma that participants bring into the testing paradigm.

The current study extends the methods used previously to include an examination of the brain's electrophysiological responses when processing images of traumatic scenes[20]. It examines the similarities and differences in the psychophysiology of affective self-regulation in the occupational trauma exposed and general population samples in both the baseline and trance

[20] The same sample of participants as in Study 3 was again employed in the current study.

induction testing conditions. In particular, it seeks to identify the distinctive role of dissociative processes in the two groups when responding to negative affective stimuli. In Study 3, it was concluded that trance induction can provide an experimental model for the experiences of compartmentalisation and detachment which frequently occur as symptoms of clinical dissociation. These dissociation-like experiences elicited during trance induction will be indexed by PCI trance state factors to determine the relationship to the modulation of emotional responding when witnessing traumatic or aversive images. Psychophysiological responses will be indexed by comparing the groups on their autonomic measures (skin conductance and HRV) and subjective distress ratings of the images in the two conditions. Cortical processing of affective responses is measured through the electroencephalogram (EEG) in order to identify how trauma exposure and dissociation impact the operation of neural networks mediating affective responses to traumatic visual scenes.

6.1.1 Vicarious Traumatisation

While the range of effects of trauma on individual wellbeing have been well established[21], an individual need not personally experience a traumatic incident in order to be effected by it. In fact, simply being exposed by hearing about or witnessing a traumatic event can have an adverse effect. As noted in Chapter 2, the *DSM-IV-TR* (American Psychiatric Association, 2000) defined a traumatic stressor as one that may involve witnessing or learning about an event that caused harm, threat, or injury to another (usually someone close such as a friend or family member). However, while this definition is limited in that it discusses hearing about trauma from those closest to us, relatively recent research has produced findings that indicate that it is not necessary for affected individuals to only be friends or relatives.

Vicarious traumatisation, which has its roots in research conducted on therapists, and first named by McCann and Pearlman (1990)[22], may be defined as the "…transformation that occurs within the therapist (or other trauma worker) as a result of empathic engagement with clients' trauma experiences and their sequelae" (Pearlman & Mac Ian, 1995, p. 558). Parallels may be observed between the *DSM-IV-TR* (American Psychiatric Association, 2000) definition of a

[21] See Chapter 2 for more comprehensive detail relating to this claim.
[22] While McCann and Pearlman (1990) coined the term "vicarious traumatisation," Charles Figley (e.g., 1983) first discussed what is known as "secondary victimisation." This concept (and others closely related to it, including "compassion fatigue" and "secondary traumatic stress") can describe how those close to a victim of trauma can themselves experience signs of traumatic exposure. Figley (e.g., 1995, p. 9) refers to this as the "'cost of caring'…for others in emotional pain."

traumatic stressor and the engagement of the trauma worker with the client/patient/victim. This engagement can involve hearing "…graphic descriptions of violent events, exposure to the realities of people's cruelty to one another, and involvement in trauma related re-enactments, either as a participant or as a bystander" and can include being a "helpless witness" to events that have already occurred (Pearlman & Saakvitne, 1995, p. 31).

Research has found that this concept, while appearing on the surface to be similar to burnout, is in fact quite distinct. Pines and Aronson (1988, p. 9) define burnout as a "…state of physical, emotional, and mental exhaustion caused by long term involvement in situations that are emotionally demanding." These emotionally demanding situations, however, are not necessarily unique to trauma work. Thus an employee in just about any occupation imaginable can perceivably experience burnout from overwork, strain, and isolation. Burnout, then, may be regarded as not specific to trauma workers in the same way as is vicarious traumatisation. Bell, Kulkarni, and Dalton (2003) make mention of some professions more likely to be at risk of vicarious traumatisation, including social workers, emergency workers, police officers, nurses, sexual assault counsellors, child protective service workers, and trauma therapists.

So what is it that these individuals actually experience after their exposure to others' trauma? Palm, Polusny, and Follette (2004, p. 73) describe reactions as diverse as: "…intrusive imagery and thoughts, avoidance and emotional numbing, hyper-arousal symptoms, somatization, and…alcohol use." What may be noted about the reactions of these trauma workers are the similarities to those who are directly affected by trauma. In a 1993 study, McCarroll, Ursano, Wright, and Fullerton interviewed and observed several hundred people who were present at the sites of three major disasters (two air crashes and an explosion) and who acted in the capacity of body handlers (i.e., those who retrieve human remains after traumatic events). They also interviewed members of occupational groups frequently exposed to violent death, including forensic pathologists, fire-fighters, police officers, emergency workers, and military officers. During exposure to these horrific situations, many individuals reported using strategies including cognitive and behavioural avoidance or distancing (i.e., denial). After exposure, many reported using alcohol, perhaps as a way to encourage a feeling of numbness, and perhaps also as a way to provide a context in which to receive social support from the work group. Regehr, Goldberg, and Hughes (2002), in their study of 86 paramedics, also found that many of the workers interviewed employed emotional distancing as a coping strategy. While the idea of distancing emotionally at

the time (and thus be able to do their job effectively at a time of high stress) is appealing, and parallels the trauma victim's experience of dissociating from extreme negative affect, a problem may arise if the worker is unable to shift back to "emotional openness." As with any coping strategy that involves distancing/dissociating or bluntness/numbness of emotions, these are only adaptive in the short term (see e.g., Nixon et al., 2005 regarding the value of employing a compensatory mechanism such as dissociation in the short term). If they proceed past the time of the trauma exposure, they run the risk of becoming maladaptive strategies.

Ultimately, what these and many other individuals who work with trauma victims experience is a shift in their way of thinking about the world. This again parallels what many trauma victims themselves experience. McCann and Pearlman (1990) speak of a disruption in the schemas of those who work with trauma. These schemas may include "…beliefs, assumptions, and expectations about self and world that enable individuals to make sense of their experience" (McCann & Pearlman, 1990, p. 137). Thus, trauma workers may experience disruptions in beliefs such as "…personal safety and personal vulnerability, benevolence of the world, and feelings of powerlessness" (Palm et al., 2004, p. 73). Being frequently exposed to the vast array of horrors that can befall any one of us, it is unsurprising that trauma workers question their own place in the world and begin to wonder whether what they are exposed to could not also happen to them.

In this thesis, those so exposed to others' traumatic events as a result of their occupation and not personally involved in a trauma (i.e., not a victim) will be referred to as the "trauma exposed." Trauma exposed individuals, therefore, are likely to use similar coping strategies in the face of traumatic events as are the victims of those events. It is important to note, though, that some researchers believe that emergency workers are a "…self-selected occupational group and may not be representative of the general population in terms of their personalities nor their coping strategies" (Beaton, Murphy, Johnson, Pike, & Corneil, 1999, p. 294). Other researchers have questioned the assumption that emergency workers are in some way different to the general population in terms of personality or ability to cope under extraordinarily stressful situations. Moran and Britton (1994), for example, investigated the stress reactions of a group of volunteer emergency workers and did not find them to be any more resilient or "hardier" than comparison subjects. However, investigating the reactions of this group is a useful proxy to those who were the victims of traumatic events and who it would be immoral to expose to further distressing stimuli given their history. In addition, research has shown that there may be little difference in

the two groups regarding their reactions to the events and outcomes post-trauma (Genest, Levine, Ramsden, & Swanson, 1990; Lamontagne, 1983). Emergency workers are (potentially) exposed to dangerous and unpredictable situations that can affect both their wellbeing and ability to adjust post-trauma. This outcome readily mirrors the trauma victim's experience.

6.1.2 The Use of Negative Affective Images as a Surrogate of a Traumatic Event

In trauma research, the focus of investigation often includes an examination of the effects of a traumatic event on how an individual has coped in the face of the event and what exposure to the event has resulted in physically, emotionally, and psychologically. However, investigating these effects at the time of the traumatic event is often not only unlikely, it is almost impossible. Some research has attempted to investigate these effects at close to the time of their occurrence, however. For example, Bryant and colleagues (e.g., Bryant & Harvey, 2003; Bryant, Harvey, Guthrie, & Moulds, 2000), in studies investigating individuals' reactions to trauma, interviewed survivors of motor vehicle accidents between two days and one month post-trauma. Additionally, Cardeña and Spiegel (1993) surveyed individuals who had lived through the devastating San Francisco Bay Area Earthquake of 1989 within one week of its occurrence. So while investigators like those mentioned were able to assess individuals in time proximities close to when the events occurred, there was still a substantial lag. Thus trauma researchers need to employ other means to investigate reactions in real time situations.

Another avenue of investigation therefore is for the researcher to utilise experimental methods which (safely) expose individuals to situations that will elicit immediate reactions with important similarities to those which trauma produces. It is neither professionally ethical nor moral to submit an individual to a traumatic event. Therefore the negative emotions elicited by traumatic events need to be simulated via other means, such as the use of exposure to aversive images (pictures or video; e.g., Bryant & Mallard, 2002; Comeau, Yeh, Abizaid, Hellemans, & D'Angiulli, 2010), trauma narratives (e.g., Griffin et al., 1997; Nixon et al., 2005) or even noxious smells or sounds (e.g., Verona, Patrick, Curtin, Bradley, & Lang, 2004). Researchers employing these types of stimuli in experimental paradigms have found that they are efficacious in producing the kind of immediate effects that mirror trauma or other intense emotional reactions.

For instance, Griffin et al. (1997) interviewed female rape victims and assessed them in three phases in a study on peritraumatic dissociation, that which that occurs at the time of a trauma. In the first phase, the individual was left alone in a room. In the second phase, the interviewer came back into the room and prompted the individual to speak on a neutral topic for five minutes. Individuals were required to speak about something that would require recall and an ability to describe what was involved in the process. An example of such a topic was "A special meal you have prepared." In the third phase, the interviewer prompted the individual to talk about their rape, in detail, for five minutes. This final phase took the females "back" to what it felt like to be assaulted; how it happened, what the assailant said and did, and the individual's feelings and reactions. The results of this study highlighted the success of such an experimental paradigm in eliciting the feelings of a specific trauma.

Another method of creating or simulating an aversive or uncomfortable feeling in participants occurs in pain research. For instance, Rainville and colleagues (e.g., Rainville et al., 1997; Rainville et al., 1999) placed participants' hands in hot water (up to 47°C) for a set period of time (one minute or until the participant voluntarily withdraws their hand) in order to simulate a painful sensation. While this kind of experimental paradigm does not induce a seemingly traumatic situation, it is not a pleasant experience and can be quite painful as rated by participants on scales of pain intensity and pain unpleasantness (Rainville et al., 1999). This paradigm (or its converse, ice cold water immersion) has been used successfully in inducing pain and indicates again the efficacy of using experimental analogues to simulate negative situations.

In studying the emotional experience surrounding any event, be it positive or negative, two affiliated dimensions are usually investigated. The first is valence which may be defined as how positively or negatively an event is experienced (Kensinger & Schacter, 2006). The other is arousal which refers to how intensely an event is experienced, and this ranges from very calming to extremely agitating (Kensinger & Schacter, 2006).

These two dimensions have their original basis in work conducted on the evolutionary principles of emotional expression. Lang and Bradley (2010), for instance, discuss the nature of "motive circuits" and their role in the survival of individuals and their offspring. Initially, this motive system was engaged by those stimuli that could either be life affirming or sustaining or that, alternatively, might cause harm to the survival of the earliest mammals. This survival system, comprising two motivational structures, of which one is appetitive and associated with

pleasant affect (or a desire to approach) and the other which is defensive and associated with negative affect (or avoidance), is still just as "fundamentally relevant" now (Lang & Bradley, 2010; Lang et al., 1997, p. 101). Thus valence involves the disposition to adopt either an appetitive or defensive motivational structure (Lang et al., 1993) depending on the meaning that the stimulus has for the individual. Arousal, on the other hand, is the intensity or strength with which either the appetitive or defensive system is activated (Lang & Bradley, 2010; Lang et al., 1993; Lang et al., 1997). Thus any experimental manipulation that aims to investigate an individual's experience of trauma should ensure that these two dimensions are accounted for.

Research such as that conducted by Kensinger and Schacter (2006) has found that using stimuli such as the images provided by the International Affective Picture System (IAPS; Lang et al., 2005) arouses activity in the amygdala and the prefrontal cortex (PFC), two areas implicated in traumatic experiences (e.g., Williams et al., 2006). In addition, Kensinger and Schacter's (2006) research was able to make a distinction between exposure to positive or negative stimuli, with the lateral PFC responding to negative stimuli and the medial PFC responding to positive items. Other researchers have also found support for activation in these areas. For example, Kawasaki et al. (2001) found neuronal responses to aversive visual stimuli as early as 120 ms after exposure in the ventromedial PFC. PET and MRI research by Morris and colleagues (e.g., Morris, Friston, & Dolan, 1997; Morris, Öhman, & Dolan, 1998) uncovered activity in the amygdala, basal forebrain, and thalamus (pulvinar nucleus) in response to aversive visual stimuli. In interpreting these findings, Schupp, Junghöfer, Weike, and Hamm (2004) claim that activation of these areas may aid selective processing in the visual cortex as, for example, information has been found to pass through the pulvinar to numerous cortical visual areas (e.g., Berman & Wurtz, 2008).

For present purposes, the use of aversive (i.e., affective) images may be regarded as an ethically acceptable and effective experimental method for the study of responses to trauma exposure. According to Lang et al. (1997), affective images effectively mobilise emotional response systems (Codispoti, Bradley, & Lang, 2001; Schupp et al., 2004). Essentially, affective imagery has the ability to activate psychophysiological systems associated with emotional responding (e.g., cardiovascular, somatic, and electrodermal systems; Codispoti et al., 2001) in much the same way as the events portrayed, if encountered in one's own life, can. Thus individuals exposed to such imagery, pleasant or unpleasant, can reliably experience joy or fear,

for instance, as a real and measurable emotional response. In addition, when viewing pictures via a computer in an experimental condition, participants are cannot flee without terminating the experiment. In other words, their "…local action is constrained" (Lang et al., 1997, p. 101). While it is acknowledged that a participant has the right ethically to call a stop to any experiment they have given informed consent to engage in, this type of paradigm (i.e., conscientious observation) may be regarded as more akin to a traumatic situation where the immediate avenues of escape are psychological rather than behavioural.

The IAPS database, as developed by Lang et al. (2005), is regarded as one of the most effective and well-established tools used in the study of emotion and attention to negative (as well as positive and neutral) stimuli. It is a widely employed database and provides a reliable and valid measure of affective responses when used in conjunction with psychophysiological measures (e.g., EEG, HRV, skin conductance, etc.), physical reactions to the images can be elicited. These experimental manipulations are thus analogous to actual experiences in individuals' lives, be they positive or negative. So, for example, while research has validated the role of the amygdala in trauma and threat processing (e.g., Schupp et al., 2004; Williams et al., 2006), other research has implicated the amygdala in the "…detection of emotional significance and in the generation of negative affective states...in response to emotional...pictures..." (Phan et al., 2005). The IAPS was employed in Phan et al.'s (2005) study and many others just like it. It is because of studies like these that the brain areas activated by traumatic and other negative episodes have finally come to light. And it is because of stimuli like those found in the IAPS that research has made such inroads into understanding what happens to a person physiologically when they are exposed to negative events, be it on the computer screen in front of them or in a real-life situation.

6.1.3 The Role of the Anterior Cingulate Cortex (ACC) and Amygdala in Emotional Processing

The anterior cingulate cortex (ACC), as mentioned in Chapter 2, is a key brain region implicated in the processing of emotional information. Bush, Luu, and Posner (2000) and Kalisch et al. (2005) describe the two principal roles and subdivisions of this region: a dorsal region (dACC) involved in the processing of cognitive-motor information and a rostral region (rACC) involved in the processing of emotional information. The affective division of the ACC is connected with the amygdala and other regions of the limbic system (e.g., hippocampus,

hypothalamus, neocortex), in addition to other connecting and interconnecting brain centres (e.g., anterior insula, nucleus accumbens, periaqueductal gray). The role of the affective division of the ACC is "…assessing the salience of emotional and motivational information and the regulation of emotional responses" (Bush et al., 2000, p. 216). In support of this claim, Devinsky, Morrell, and Vogt (1995) state that research has found that the ACC may be associated with the appraisal of painful stimuli and, in particular, in elucidating the "…affective content of noxious stimuli"…(p. 284). In addition, and as mentioned in Chapter 2, Rainville and colleagues (1997, 2002) have also implicated the ACC in pain processing and affect regulation.

Recent research, however, has raised questions about the simplicity of this dichotomy of functional organisation. Etkin, Egner, and Kalisch (2011), for instance, claim that emotional processing may not be limited to merely the ventral regions of the ACC and medial prefrontal cortex (MPFC). They claim that recent research in the areas of human neuroimaging, animal electrophysiology, and human and animal lesion studies is revealing that the dorsal region is also reliably involved. As such, Etkin et al. (2011) propose that rather than a simple cognitive versus emotional distinction, the ventral region is associated with regulation of emotional responses and the dorsal with appraisal and expression of specifically *negative* emotion.

Research has thus implicated the amygdala, found in the anterior temporal lobe, as an important brain region for the processing of emotional stimuli,[23] be it positively or negatively arousing (e.g., Hamann et al., 2002; Kim & Hamann, 2007). However, given the amygdala's multiple connections with other brain regions, Derryberry and Tucker (1992) claim that it is "…difficult to speak of its general function" (p. 333). According to Zald (2003), the amygdala is involved in both the appraisal of and response to emotionally salient stimuli. It plays a key role in evaluating the information present in the immediate environment and identification of likely sources of harm (Weber, 2004), in which event it prepares the brain-body to respond strongly for maximum effectiveness. Recent research using brain imaging techniques (Positron Emission Tomography [PET], functional magnetic resonance imaging [fMRI]) has found that the amygdala responds preferentially to negative/aversive/fear-related stimuli and events (Kensinger & Schacter, 2006). For example, in a PET study conducted by Hamann et al. (2002), participants were shown a series of pleasant, unpleasant, and neutral images. The pleasant images elicited

[23] Other roles implicating the amygdala, such as in associative learning (e.g., Killcross, 2000), for example, will not be discussed here as they are beyond the scope of this thesis.

activity in the left amygdala and ventromedial prefrontal cortex. The unpleasant images showed bilateral but primarily left-lateralised amygdala activity (Hamann et al., 2002). These findings were consistent with others in the field (e.g., Canli, Zhao, Brewer, Gabrieli, & Cahill, 2000; Lane et al., 1997). Lane et al. (1997) found similar results in their PET study examining the neural substrates of the appetitive and aversive motivational systems. In this study, participants were shown sets of images displaying pleasant, unpleasant, and neutral themes. Examining the PET measurements of regional cerebral blood flow (CBF), the researchers found activity during the presentation of pleasant and unpleasant pictures in the thalamus, hypothalamus, midbrain, and MPFC. There were no significant CBF differences found between pleasant and unpleasant emotional experience in these areas. Only unpleasant and not pleasant pictures activated blood flow in the left amygdala. An interesting fMRI study conducted by Garavan, Pendergrass, Ross, Stein, and Risinger (2001) found that activation of the amygdala did not differ between positively and negatively valenced images. However, while activity appeared to be modulated in response to images rated as highly negatively arousing, both pleasant and unpleasant images elicited amygdala activity. This contravenes other research in the field which has not found such a result. However, it is clear that research has found that the "central role of the amygdala is responding to emotionally significant situations" (Killcross, 2000, p. 503) be they positive or negative.

6.1.4 EEG and Reactions to Aversive Stimuli

Psychophysiological measures (e.g., skin conductance and HRV) have been used to investigate individuals' responses to negative affective stimuli and, as found in Chapter 5, fairly consistent findings are to be expected with the use of these measures. Primarily, skin conductance responses increase and heart rate generally slows in response to aversive stimuli. EEG has also been widely employed for studies investigating central processing of emotional events. EEG is able to directly measure the processing activity evoked in the brain when individuals respond to negative or aversive stimuli.

A robust finding of EEG research on physiological responses to arousing stimuli is that viewing pictures of emotional content (either pleasant or unpleasant) evokes larger late positive potentials (LPPs) than viewing pictures with neutral content (e.g., Codispoti, Ferrari, & Bradley, 2006, 2007; Schupp et al., 2000). Event-related potentials (ERPs) are electrophysiological brain

responses to an internal or external stimulus[24] and are measured via EEG. ERPs are computed by averaging epochs of EEG time-locked to a particular stimulus presentation and therefore "…provide evidence of a direct link between cognitive events and brain electrical activity…" (Penny, Kiebel, Kilner, & Rugg, 2002, p. 387). These ERPs thus reveal a series of positive and negative peaks that are thought to reflect phasic activity (i.e., arousal) in one or more brain regions (Yeung, Bogacz, Holroyd, & Cohen, 2004). ERPs thus measure the neuronal activity induced by the stimulus (Teplan, 2002). ERPs also have excellent temporal resolution; that is, changes that occur in mere milliseconds are capable of being detected (Hugdahl, 2001). The LPP is an ERP that has a latency of approximately 300 milliseconds after stimulus onset (Andreassi, 2007). While this ERP has classically been referred to as the P300, the fact is that the ERP can refer to any time from 250 to 900 milliseconds (see Andreassi, 2007). The LPP has been found to reflect attention to stimuli delivering emotional or significant information (Andreassi, 2007; Dennis & Hajcak, 2009), specifically pictures containing emotional or arousing content (see Codispoti et al., 2006, 2007; Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000; Dennis & Hajcak, 2009; Lang & Bradley, 2010; Schupp et al., 2000) and, as a result, Lang and Bradley (2010, p. 442) state that the LPP elicited by picture stimuli is a "…replicable index of their motivational relevance" (either appetitive /positive/approach or defensive/unpleasant/avoid).

Findings from studies measuring psychophysiological reactions to painful or traumatic stimuli have also found that there are differences between those high and low in hypnotic susceptibility. For instance, research by Ray, Keil, Mikuteit, Bongartz, and Elbert (2002) found that individuals high in hypnotic susceptibility, relative to those low in susceptibility, were able to modulate the later components of the ERP when administered a painful stimuli (i.e., electric shocks administered to the proximal joint of the middle finger). Other research by Rainville et al. (1999) found that hypnotic susceptibility correlated with both pain unpleasantness and pain intensity modulation[25]. Those classified as moderate to high in hypnotic susceptibility experienced marked reductions in pain unpleasantness ratings after being administered a hypnotic induction relative to those low in susceptibility. In addition, when participants were given instructions to alter their experience of the pain, the modulation of these intensity ratings was higher for those high in susceptibility relative to lows. As mentioned in Chapter 2, Santarcangelo and Sebastiani (2004)

[24] Hugdahl (2001) makes the point that ERPs can also occur in the absence of a stimulus. An example of just such an omission that Hugdahl provides is when an expected event is excluded from a series of stimuli. Thus the potential is not evoked by stimuli.

[25] The painful stimuli administered was the immersion of the participant's hand in hot (c. 47°C) water.

also found that individuals high in hypnotic susceptibility demonstrated a level of "protection" from cardiac stress as they were able to actively suppress their cardiac-respiratory output when confronted with an unpleasant stimulus[26] and were therefore better able to regulate the somatic consequences of aversive events.

6.1.5 The Current Study

The aim of the current study, therefore, is primarily to investigate the nature of the relationship between adult exposure to trauma, the dissociation-like experiences which emerge during trance induction, and the affective response mechanisms elicited by simulating a traumatic episode by exposing participants to a series of negative affective images. This study will thus create what Schupp et al. (2000) refer to as a hedonic context[27]; that is, the repeated presentation of same valence stimuli (i.e., *only* unpleasant images). The rationale for presenting only unpleasant pictures is to not allow participants a brief "escape" from their environmental stress. In a real-life, a traumatic episode will typically be experienced as a continuous event. Thus the decision was made, based on work by Schupp et al. (2000), Bradley et al. (1996), and Codispoti et al. (2006, 2007), that no other images (i.e., pleasant or neutral) would be presented.

While some degree of habituation may be expected within blocks of stimuli, this would itself constitute one aspect of the affective self-regulatory responses under study. However, Bradley et al. (1996) presented blocks of images (pleasant, neutral, and unpleasant) to participants for six seconds with a six second inter-picture interval in a paradigm with considerable similarities to that adopted here. They found that the participants' reactions (i.e., facial corrugator electromyographic activity, startle responses, skin conductance, and heart rate) were either maintained or sensitised across trials in a block. They did not, however, find that responses habituated in this paradigm. That is, emotional reactions did not diminish over time. In an interesting extension, Codispoti et al. (2006, 2007) conducted an EEG and psychophysiological study (heart rate and skin conductance) where they presented a series of three affective images (pleasant, neutral, or unpleasant) 60 and 90 times to participants. They found that while the late positive potential (as measured by the EEG) was weakened across all trial types with repetitive viewings, affective modulation per se was undiminished as greater cortical positivity 400 to 800

[26] Being asked to either remember or imagine an unpleasant event.
[27] Bradley et al. (1996) also use the term "sustained affective context."

milliseconds after picture presentation was maintained for both the pleasant and unpleasant images compared to the neutral images (Codispoti et al., 2006).

The current study follows on from Study 3 which examined the associations between recalled childhood abuse, state and trait measures related to dissociation, and the measures of autonomic regulation (i.e., skin conductance and HRV) in response to aversive images. In the current study, the impact of adult exposure to trauma through high risk occupations, as well as that of dissociation-like experiences during trance induction, on the response mechanisms elicited by viewing traumatic images is investigated using event-related potentials (ERPs) to identify the neural signature of these mechanisms. Additional measures of dissociation-related changes in affective self-regulation included change scores between the baseline and trance induction conditions (baseline minus trance) for skin conductance, the low and high frequency components of HRV, and the average subjective intensity ratings of the images in each condition.

Some concerns regarding the use of change scores have been raised. For example, Linn and Slinde (1977, p. 147) claim that "Problems in measuring change abound and the virtues in doing so are hard to find. Major disadvantages in the use of change scores are that they tend to conceal conceptual difficulties and they can give misleading results." However, there is an alternative view on the use of change scores. Gardner and Neufeld (1987, p. 850) make counter that the options that researchers such as the above provide for alternative methods of assessing change are complex and "…lack the intuitive appeal of the simple change score…." According to Gardner and Neufeld (1987, p. 863), the change score has the ability to elegantly "…explain the processes taking place from one testing session to the next." Thus change scores were employed in the current study in order to examine the modulation of negative affect between the baseline and trance induction conditions for the measures of HRV and skin conductance, and the subjective intensity ratings of the aversive images.

A series of mixed model ANOVAs investigated whether members of the two samples employed in this study (i.e., general population and trauma exposed) demonstrated significant differences in their measures of autonomic arousal (i.e., skin conductance and heart rate variability) and their experience of negative affect as indicated by subjective intensity ratings of the viewed images between the baseline and trance induction conditions. These analyses thus examined the effects of trance induction (and consequently trance-related dissociation) in

reducing or modulating these three aspects of the emotional response to the traumatic images viewed in this study.

Given that the occupational exposure group is likely to regularly encounter situations of violence and trauma inherent in their working life, it was thus predicted that this sample would possess a range of well-developed self-regulatory mechanisms (dissociation related or otherwise) to control their emotional responses to viewing the traumatic images employed in this study in a manner which contrasts strongly with that of the general population sample. Considering the hazards of their work, this sample would likely utilise diverse coping mechanisms in order to manage their distress. Thus this study surmised that the occupational trauma exposure sample would experience less intense emotional responses (autonomic regulation and subjective experience) than the general population sample. It was also expected that the occupational trauma exposure group would show greater stability in these aspects of emotional response between the baseline and trance induction conditions than the general population sample as they would likely be in a state of preparedness to deploy these self-regulatory mechanisms.

In order to identify the neural networks responsible for differences in emotional processing of traumatic stimuli between the occupational trauma exposure and general population samples in the baseline and trance induction conditions, a Partial Least Squares (PLS) analysis (Lobaugh, West, & McIntosh, 2001; McIntosh, Bookstein, Haxby, & Grady, 1996; McIntosh & Lobaugh, 2004) was conducted on the EEG data. PLS is a form of multivariate analysis, particularly useful in EEG and neuroimaging studies, which assesses the linear relationships between a set of independent measures (the conditions of the experimental design) and a set of dependent measures (in this case, the EEG data obtained as a time series at each electrode). PLS computes the optimal least-squares fit to the cross-block correlation between the independent and dependent measures (Lobaugh et al., 2001). Thus PLS enables the examination of the relationship between neural activity and the experimental design (Lobaugh et al., 2001; McIntosh et al., 1996).

The aim of the PLS analysis was to enable the examination of the neural networks underlying the response to the negative affective stimuli (traumatic images) elicited in the two groups of participants in the baseline and trance induction conditions. In order to assess the relationship of the neural mechanisms of the affective processing identified by significant latent variables (LVs) to trance-like dissociation, the pattern of participants' LV scores were examined across the

experimental conditions. Within the conditions and contrasts defining a significant LV, a further set of correlations was calculated between participants' LV scores in that condition and/or contrast and trait and state measures of trance-like dissociation. Finally, these LV scores were assessed in relation to the self-report and psychophysiological measures of emotional response outlined above.

6.2 Method

6.2.1 Participants

Data were collected from a total of 51 participants (the same individuals as in Study 3) in two samples. The details of these two groups are given below.

6.2.1.1 Sample 1

In sample 1, data were collected from 20 participants (16 males and four females). Participants ranged in age from 27 to 65 years (M = 43.81, SD = 10.60) for males and 36 to 57 years (M = 47.75, SD = 9.29) for females. An independent samples t-test found no significant differences between males and females on age, $t(18) = -.68$, $p = .506$, $d = -0.38$. The majority of participants were classed as Other Tradespersons and Related Workers (according to the ANU3_2 scale of occupations; McMillan & Jones, 2000; see also Jones & McMillan, 2001 for a discussion on the new ANU4 scale) and worked as fire-fighters (30%). Other prominent occupations included those classed as Other Associate Professionals (i.e., police officers; 25%), Health Professionals (i.e., nurses; 15%), and Health and Welfare Associate Professionals (i.e., ambulance officers; 15%). While there was a sex bias in this sample with substantially more males than females, data from the Australian Bureau of Statistics 2006 Census indicates that males are more likely than females to enter into the professions associated with "Protective Service Workers" (males = 90,914 versus females = 20,487). Occupations in this category include police officers and fire-fighters. In the current sample, there were 11 individuals who were employed in these two areas with the majority being male (nine; 82%).

As in Study 3, all participants reported normal hearing, normal or corrected to normal vision, and no known psychiatric or neurological problems. Participants gave written informed consent to participate in the study and were paid $10 for taking part.

6.2.1.2 Sample 2

The second sample of data was collected from 31 participants (12 males and 19 females), referred to as a general population, comprised largely of university students (94%). Participants ranged in age from 19 to 61 years (M = 32.33, SD = 15.71) for males and 18 to 52 years (M = 27.89, SD = 9.91) for females. Again, no significant differences between males and females in age was found, $t(29) = .97$, $p = .341$, $d = 0.36$. Again, all participants reported normal hearing, normal or corrected to normal vision, and no known psychiatric or neurological problems. Individuals gave written informed consent to participate in the study and were paid $10 for taking part.

6.2.1.3 Between-Groups Analyses

An independent samples t-test analysis was used to compare the general sample population and occupational trauma exposed group on age. The result was significant, $t(49) = -4.50$, $p < .001$, $d = -1.29$, indicating that the general sample was significantly younger (M = 29.61, SD = 12.42) than the trauma exposed group (M = 44.60, SD = 10.24).

A Pearson's chi-square test was also conducted to evaluate whether gender is related to group membership. The analysis was significant, χ^2 (1, N = 51) = 8.37, $p < .01$, $\Phi = .41$. Thus females were significantly more likely to be members of the general sample population than of the occupational trauma exposed group.

6.2.2 Materials

6.2.2.1 Self-Report Measures

This study was similar to Study 3 and also involved the administration of a paper-and-pencil questionnaire package. The same instruments that examined absorption (i.e., Modified Tellegen Absorption Scale [MODTAS]; Jamieson, 2005), fantasy proneness (i.e., Inventory of Childhood Memories and Imaginings-Frequency Format [ICMI-F]; Fellows & Wright, 1989; Hough, 2006), imagery ability (i.e., Betts' Questionnaire Upon Mental Imagery [QMI]; Sheehan, 1967), phenomenological experience (i.e., PCI; Pekala, 1991a), and childhood trauma (i.e., Child Abuse and Trauma Scale [CATS]; Sanders & Becker-Lausen, 1995) were once again administered to these participants. So in addition to requiring participants to write their age and sex, they were also requested to state their occupation or membership of an organisation. Prior to the experimental manipulation, participants were screened for their level of psychological distress

(using the Kessler Psychological Distress Scale [K10]; Kessler et al., 2002) with those scoring higher than the predetermined cut-off score of 30 excluded from further participation[28].

6.2.2.2 Stimulus Materials

Task 1 – Baseline Condition and Task 2 – Trance Induction Condition. The stimulus materials for these tasks were identical to those in Study 3.

Audio material. The audio file used in this experimental task was identical to that used in Studies 1, 2, and 3.

6.2.2.3 Stimulus Creation and Presentation

Stimuli were created and presented as in Study 3.

6.2.3 EEG Data Acquisition

In this study, participants' brain electrical activity while viewing negative images (depictions of traumatic scenes) was measured via EEG. First described by Richard Caton in 1875 in his work on rabbits and monkeys (Andreassi, 2007), Hans Berger was the first to publish research on the EEG in humans in 1929. Scalp EEG is a direct measure of the electrical activity generated by the brain (Stern et al., 2001). It is generated by the summation of cortical postsynaptic potentials (Kaiser, 2006). The source of the EEG is the current flow between the soma and apical dendrites of pyramidal cells (Teplan, 2002). While there are many advantages to EEG (e.g., non-invasive, inexpensive, convenient, a long history of investigation), newer technologies (e.g., fMRI, PET) have better spatial resolution and are able to detect activity in regions such as the cerebellum and subcortex (Kaiser, 2006).

EEG is typically acquired when a participant is fitted with a cap embedded with electrodes, generally one to 15 millimetres in diameter. Traditionally, electrodes have been arrayed in what is known as the 10-20 International system. This system divides the skull into proportional distances based on four landmarks: the nasion (dent of the nose), inion (the protrusion at the back of the head), and the points in front of each ear (Kaiser, 2006). Each electrode corresponds to particular brain regions: F (frontal), C (central), T (temporal), P (posterior), and O (occipital). The letters on each electrode are accompanied by a number: even numbers on the right side and

[28] No participants were excluded based on their K10 scores.

odd numbers on the left side. In addition to these electrodes there is often a ground and reference electrode. In a grounded system, electrical activity is detected as a difference between two electrodes (Kaiser, 2006). In a system that utilises a reference electrode, all electrodes are paired to the same physical reference (often positioned on the ear[29]).

In the current study, participants were fitted with an elastic Compumedics Neuroscan Quik-Cap© in order to collect EEG data. Prior to their arrival, participants were advised to have clean, shampooed hair but not to have used any sorts of hair products, including conditioner. This was to minimise impedance of the electrical field.

EEG recordings were taken from 40 silver/silver chloride sintered electrodes arranged according to a modified version of the International 10-20 System. Six drop-down leads were also attached at A1 (right ear), A2 (left ear), VEOL and VEOU (vertical electro-oculogram, placed approximately one centimetre below (L) and above (U) the left eye), and HEOL and HEOR (horizontal electro-oculogram left (L) and right (R) outer canthi). The following channels were recorded in addition to those mentioned: FP1, Ground (anterior to Fz), FP2, F7, F3, Fz, F4, F8, FT9, FT7, FC3, FCz, FC4, FT8, FT10, T3, C3, Cz, C4, T4, TP7, CP3, CPz, CP4, TP8, T5, P3, Pz, P4, T6, O1, PO1, PO2, O2, and Oz (See Figure 6.1). The cap was placed according to measurements from the nasion and the inion. During recordings, all electrode impedances were below 30 kΩ.

[29] In the current study the reference electrode was fitted at A1, the right ear.

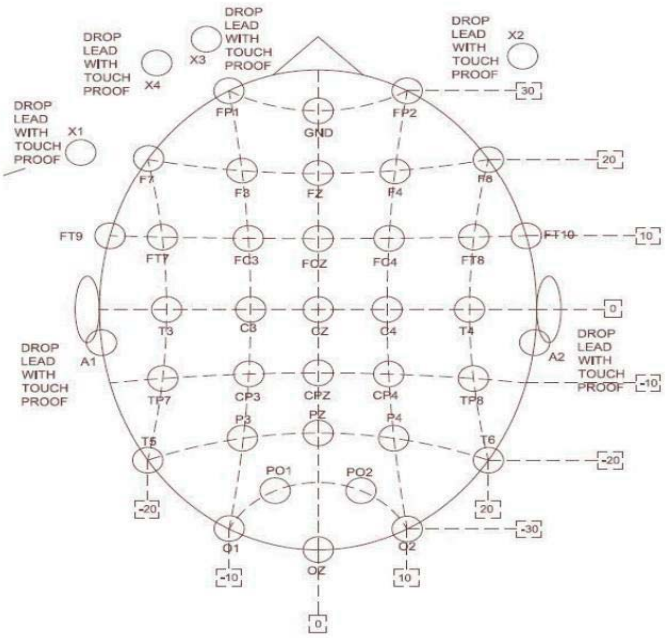

Figure 6.1. Forty-channel NuAmps Quik-Cap© electrode layout; Compumedics Neuroscan Ltd. Reprinted with permission.

Data were collected using an AMD computer with Athlon Processor. EEG signals were amplified with 0 (DC) – 100 Hz band-pass and digitised with a 32-bit A/D converter using a NuAmps DC amplifier and ACQUIRE 4.3.1 software (Compumedics Neuroscan, 2003). Most recordings were conducted at a 500 Hz sampling rate. Some participants were recorded at the higher rate of 1000 Hz, but their files were decimated to 500 Hz after recording and prior to analysis.

Prior to exposure to the experimental paradigm, participants completed an eye-movement artefact correction task (Croft & Barry, 2000) while recording at VEOL, VEOR, HEOL, and HEOR. Eye movements contaminate the electrical fields around the eyes and, as a result, interfere with the electrical fields on the scalp (Croft & Barry, 2000). Thus, recordings of typical eye movements are made and then analysed using an algorithm that subtracts one from the other (e.g., VEOU – VEOL; Croft & Barry, 2000).

Participants were required to follow with their eyes only, and without moving their head, a square that changed position on the screen. First, they watched the square move up and down and down and up (i.e., vertical movement) 40 times per change. Next, the square moved from left to right and right to left (i.e., horizontal movement) 40 times per change. The stimulus for these two parts of the task was presented on screen for 800 milliseconds with a 200 millisecond inter-stimulus interval (ISI). For the final part of the task, the square was positioned in the centre of the screen and changed colour from brown to blue and blue to brown. Participants were required to blink with each colour change. This stimulus was presented for 1000 milliseconds with a 200 millisecond ISI. In total, this task took approximately three minutes to complete (see Figure 6.2).

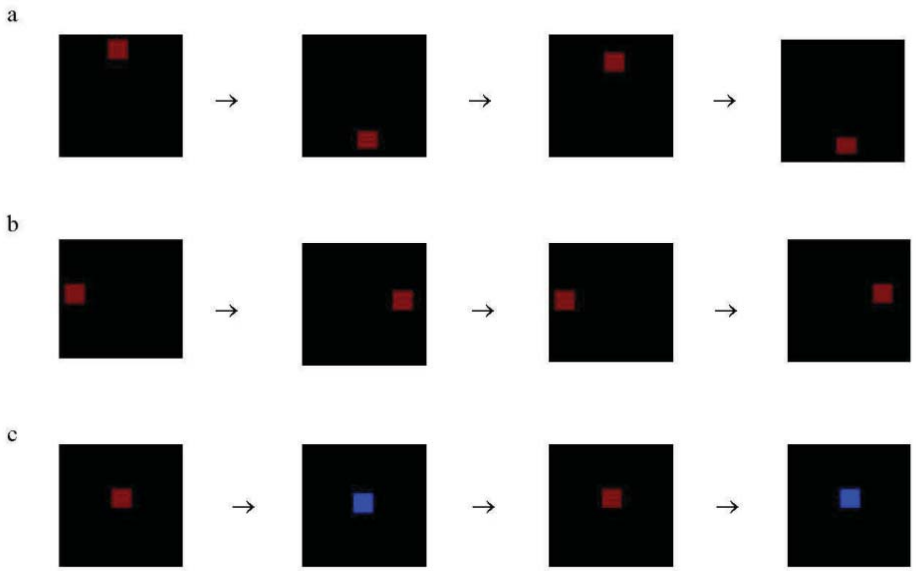

Figure 6.2. A visual representation of the eye-movement artefact correction task. This task required participants to follow with their eyes only: (a) a vertically moving square, (b) a horizontally moving square, and (c) to blink when the square changed from brown to blue and blue to brown. From *Cognitive control: Modulating conflict between competing responses* (Unpublished doctoral dissertation) by D. Newby, 2009, University of New England, Armidale, Australia. Reprinted with permission.

6.2.4 Procedure

Prior to the arrival of a participant in the laboratory, the EEG caps and drop-down electrodes were prepared by inserting a sponge inside each electrode.

Participants were met at the laboratory by the researcher and asked to read an information sheet outlining the aims and procedure of the study in addition to containing the researcher's contact details should they wish to find out the results of the study once they became available. Participants then signed a consent form agreeing to have their EEG, recorded whilst viewing negative images. After this, each participant completed the K10 (Kessler et al., 2002). Scores below 30 (i.e., not at a high risk for developing anxiety and/or depression) meant that the participant would be able to proceed.

After completing the forms, participants were given a small round brush with stiff plastic bristles with which to vigorously brush their scalp (not their hair) for approximately two minutes in order to remove debris and exfoliate the scalp. The participants were then invited to move into an inner room where the testing would take place and to make themselves comfortable. Once seated, they were presented with the larger questionnaire package containing the MODTAS (Jamieson, 2005), the ICMI-F (Fellows & Wright, 1989; Hough, 2006), and the Betts' QMI (Sheehan, 1967). While completing these measures, participants had the skin on their face exfoliated with NuPrep®, an abrasive gel designed to reduce skin impedance, and then wiped with a cotton wool ball dipped in a rubbing alcohol.

The EEG cap was then fitted on the participant's head and secured with a Velcro® chinstrap. Each of the drop-down electrodes (HEOL, VEOL, VEOU, VEOR, A1, and A2) was attached to the cap and then, one-by-one, attached to the skin. Each of the electrodes were injected with 130 µl saline solution comprising deionised water, electrolytes, and a drop of baby shampoo using an electronic Eppendorf Research® pro pipette. After injecting each drop-down electrode, it was secured with a small piece of surgical tape in order to prevent it slipping off the surface of the skin. After attaching and injecting the drop-down electrodes, each of the cap's electrodes was also injected.

Once the cap was prepared and the questionnaire package was complete, participants were informed that they would first begin the experiment with the eye-movement artefact correction

task. They were also advised about the nature of EEG recording and that minimum body movement was required whenever EEG was being recorded.

At the completion of the eye correction task, a computer keyboard on a piece of board was placed across the participant's chair above their lap. Participants were then informed about the nature of the first part of the experimental task (i.e., the baseline condition). This was identical to the procedure used in Study 3 and took approximately nine minutes to complete.

Once the baseline condition was complete, participants completed a copy of the CATS (Sanders & Becker- Lausen, 1995) and were then told they were going to experience an intervening task which required them to simply sit quietly and watch, on the computer screen, a series of faces with different emotional expressions. This task took approximately six minutes to complete and is not reported further.

At the completion of this interim task, participants were informed that they were going to listen to an audio file and to make themselves comfortable. The researcher then carefully fitted the participant with headphones. They were then told that no task was required to be undertaken during this time. At the end of the first part of the audio (approximately nine minutes), the researcher came back into the room and participants completed part two of the experimental task (i.e., the trance induction condition) which, except for the administration of the trance induction, was identical in procedure to part one. However, participants were asked to be mindful of the state that they were now in after having listened to the audio. They were asked to allow that state to continue while completing the next task. Participants' EEG was recorded during this second task which again ran for approximately nine minutes. When the task was completed, participants listened to the remaining one minute, 51 seconds of the audio after which they completed a copy of the PCI (Pekala, 1991a) in relation to the time they listened to the audio and not when they were completing the experimental task.

Once the participant had completed the PCI, the experiment was complete. The researcher carefully removed the headphones, the facial drop-down electrodes, and EEG cap. The entire experimental process took approximately two hours. Participants were then thanked for their time and involvement and given $10.

6.2.5 Signal Preparation

As previously noted, the effects of ocular movement artefacts should be addressed prior to the analysis of raw EEG data (particularly when presenting visual stimuli). This was achieved in the current study using the revised aligned-artefact average (RAAA) procedure developed by Croft and Barry (2000), and based on an electrooculogram (EOG) algorithm. This method uses regression weights derived from a series of calibration trials to correct for eye blink and saccade data, with the average error rate being approximately 1μV (Croft & Barry, 2000).

Following eye movement correction, data were visually inspected and contaminated sections (i.e., any motion artefacts and/or noisy channels) were marked for rejection. Two corrupt recordings (one from Sample 1 and one from Sample 2) were permanently discarded. The remaining data files were band-pass filtered from 0.5 to 45 Hz at 48 dB/octave roll off with zero phase shift in order to attenuate noise. The data were then re-referenced to the common average also creating a global field power (GFP) channel (Skrandies, 1990). Epochs were created with intervals ranging from -200 milliseconds to 1000 milliseconds stimulus presentation. The epochs were then baseline corrected from -200 milliseconds to baseline (0 milliseconds) followed by artefact rejection in the time domain. This artefact rejection was set at -50μV to +50μV and was applied to all channels except GFP, VEOU, VEOL, HEOR, HEOL, A1, and A2. Finally, each file was averaged in the time domain according to the response selection rating of each of the images (i.e., 1, 2, 3, or 4).

6.2.6 ERP Analysis

Event-related potentials (ERPs) were computed for each group (general population and occupational trauma exposed) for each of the four conditions: baseline low, baseline high, trance low, and trance high, representing the combinations of subjective rating responses (low = 1 and 2; high = 3 and 4). These ERPs were then analysed using PLS analysis (Lobaugh et al., 2001; McIntosh & Lobaugh, 2004). PLS is a method related to principal components analysis and factor analysis that is used here to analyse the set of LVs defined (in succession) by maximal linear relationships between the set of orthogonal contrast vectors coding the experimental design (design matrix) and the total ERP data matrix composed of electrodes time points participants experimental condition (data matrix).

PLS uses the matrix algebra technique known as singular value decomposition in order to decompose the cross-block covariance between the elements of the design matrix (experimental conditions) and elements of the data matrix (EEG electrodes and time points) into a reduced set of mutually orthogonal LVs (McIntosh et al., 1996). Thus far PLS bears a close resemblance to the method of principal components analysis (PCA) familiar to most psychologists. In the case of PLS (unlike PCA), each LV consists of a set of two vectors: a singular image and a singular profile (Düzel et al., 2003). The singular image corresponds to the electrode saliencies, that is, the set of weights at each electrode at each time point in the ERP that define the activity of the LV as a whole, while the singular profile consists of the set of design saliencies which correspond to the expression of the LV across the set of conditions comprising the experimental design. Calculating the dot product of the vector electrode saliencies with the raw data matrix results in whole head or scalp scores for each individual in each experimental condition for that LV (similar to the calculation of factor scores in factor analysis). Therefore, the design saliencies represent the relationship of these LV scores across the set of experimental conditions.

The significance of each LV is determined by a permutation test in which each participant's ERP data is randomly reassigned (without replacement) to experimental conditions and the PLS analysis recalculated. After 2500 iterations, the exact probability that the singular value of the original LV is exceeded by the singular value of the LV from the randomised PLS is calculated. Only LVs with $p < .05$ are retained for interpretation. PLS makes no a priori assumptions about the electrodes (topography) and time course of experimental effects. These are defined by the electrode saliencies of each LV. Bootstrap estimation (Efron & Tibshirani, 1986) is employed to estimate the reliability of the electrode saliencies. Standard errors of the electrode saliencies were calculated by bootstrap resampling with replacement for 500 iterations retaining the assignment of participants to experimental conditions. Time points where the salience is greater than twice the standard error (and thus reliable) are indicated above or below the electrode salience plots. Thus PLS allows the determination of the reliable topography and time windows of the LV effects between experimental conditions in a single test without the need to correct for multiple comparisons.

6.3 Results

6.3.1 Additional Bivariate Correlation Analyses

In the current study, four additional variables were created in order to investigate the relationship between the impact of trance induction on the self-regulation of affective responses and the state and trait measures related to dissociation examined in Study 3.These new variables were change scores between the baseline and trance induction conditions (baseline minus trance) for the emotional responses of skin conductance, the average intensity ratings, and the low and high frequency components of HRV. The results of these analyses can be found in Table 6.1.

The preeminent results of this analysis involve the correlations of the average intensity ratings change score with several variables. First, this variable positively correlated with the CATS subtype sexual abuse ($r = .29$, $p < .05$) followed closely (but without reaching significance) by emotional abuse ($r = .25$, $p = .073$). This result appears to indicate that the difference between the score allocated in the baseline versus the score allocated in the trance induction condition (that is, the reduction in subjective distress following trance induction) is positively associated with the recall of these particular types of abuse. Thus, the more people recalled these specific types of abuse the greater was their decrease in distress ratings in the trance induction condition relative to the baseline condition. Importantly, there were negligible relationships between the ratings change score and the other two types of abuse: neglect ($r = .08$, $p = .564$) and physical abuse ($r = .10$, $p = .482$).

The average intensity ratings change score also significantly positively correlated with the ICMI-F dimension vivid fantasy ($r = .33$, $p < .05$), followed closely (but without reaching significance) by the total ICMI-F score ($r = .27$, $p = .058$). The PCI factor Altered Awareness ($r = .30$, $p < .05$) also correlated significantly and positively with average intensity change. These results indicate that the more people indicated that they experience vivid fantasies the greater was their decrease in distress ratings in the trance condition relative to the baseline condition. Likewise, the more people rated themselves as experiencing greater altered awareness during the trance induction, the greater was the decrease in distress in the trance condition relative to the baseline condition.

Additional results of interest includes the negative correlation found between the skin conductance change score and the PCI Imagery dimension ($r = -.30$, $p < .05$). This result

indicates that the more reactive (less modulated) the skin conductance response in the trance induction condition relative to the baseline condition, the lower the amount and vividness of imagery reported during the trance induction. In other words, the presence of imagery during trance induction was directly related to the subsequent modulation of skin conductance in the trance condition.

Finally, both the low frequency and high frequency change scores of HRV negatively correlated with PCI Altered Awareness (in both cases $p < .05$). This result indicates that the greater the decrease in low frequency and high frequency regulation of heart rate in the trance induction condition relative to the baseline (i.e., the more positive the change score), the lesser was the experience of alterations in awareness during trance instruction (and vice versa).

Table 6.1

Bivariate Correlation Analyses among the Major Study Variables and Skin Conductance Change Score, Average Intensity Ratings Change Score, and Low and High Frequency Components of Heart Rate Variability Change Scores

Variable	SCR Change	Average Intensity Ratings Change	LF Change	HF Change
1. MODTAS	-.09	.22	-.13	-.10
2. ICMI-F	-.00	.27	-.22	-.21
3. Altered state (ICMI-F)	-.06	.21	-.21	-.17
4. Imagination (ICMI-F)	-.01	.06	-.15	-.16
5. Vivid fantasy (ICMI-F)	.13	**.33***	-.22	-.24
6. Betts' QMI	.12	.00	-.04	.04
7. Altered awareness (PCI)	.13	**.30***	**-.29***	**-.32***
8. Negative affect (PCI)	-.08	-.14	-.02	.05
9. Self-control (PCI)	-.06	.03	.10	.09
10. Positive affect (PCI)	.08	.16	-.21	-.25
11. Imagery (PCI)	**-.30***	.08	.03	.01
12. Emotional abuse (CATS)	-.03	.25	-.07	-.11
13. Neglect (CATS)	-.04	.08	.08	.04
14. Physical abuse (CATS)	-.17	.10	-.01	-.02
15. Sexual abuse (CATS)	-.07	**.29***	-.11	-.14
16. HF (Baseline)	-.18	-.01	.66***	.66***
17. LF (Baseline)	-.19	-.03	.82***	.70***
18. HF (Trance)	.12	.31*	-.43**	-.55***
19. LF (Trance)	.06	.27	-.50***	-.53***
20. SCR (Baseline)	.88***	-.14	-.09	-.16
21. SCR (Trance)	.25	-.25	.13	.05
22. Average Intensity Rating (Baseline)	.00	.28*	.04	-.00
23. Average Intensity Rating (Trance)	.01	-.24	.14	.13
24. SCR Change Score	1	-.02	-.20	-.25
25. Ratings Change Score	-.02	1	-.18	-.24
26. LF Change Score	-.20	-.18	1	.91***
27. HF Change Score	-.25	-.24	.91***	1

Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$
SCR = Skin conductance response; LF = Low frequency; HF = High frequency.
Age and sex were both included in this analysis, however, no significant findings were revealed and thus are not reported in the table.

6.3.2 Mixed Model ANOVAs

A series of 2 2 mixed model ANOVAs were conducted on several objective variables for the two conditions (baseline and trance) for the two samples (general and trauma exposed) for the emotional response measures of skin conductance data, average intensity ratings, and the HRV data (low frequency and high frequency). The means and standard deviations for these analyses can be found in Table 6.2.

In the first analysis investigating the skin conductance responses of the two groups in the two conditions, the ANOVA revealed that skin conductance did not alter between the baseline and trance conditions for either the general population or trauma exposed samples in either condition, $F(1, 46) = .50$, $p = .485$, partial $\eta^2 = .01$.

The average intensity ratings of the viewed images were compared between the general population and trauma exposed samples in both conditions. Results of the ANOVA revealed a significant main effect for the average intensity ratings, $F(1, 49) = 22.63$, $p < .001$, partial $\eta^2 = .32$ indicating that the average intensity ratings differed between the baseline and trance conditions. Additionally, a significant main effect for group was also found, $F(1, 49) = 5.69$, $p < .05$, partial $\eta^2 = .10$ indicating that the general population and trauma exposed samples differed in their average intensity ratings of the viewed images. A significant interaction effect was also found between the average intensity ratings and the sample (general or trauma exposed), $F(1, 49) = 9.58$, $p < .01$, partial $\eta^2 = .16$ indicating that the ratings across conditions differed between the general population sample and the trauma exposed sample (see Figure 6.3). There was a significantly greater reduction in the mean intensity ratings of the general population sample between the baseline and trance conditions relative to the trauma exposed sample (see planned comparisons below).

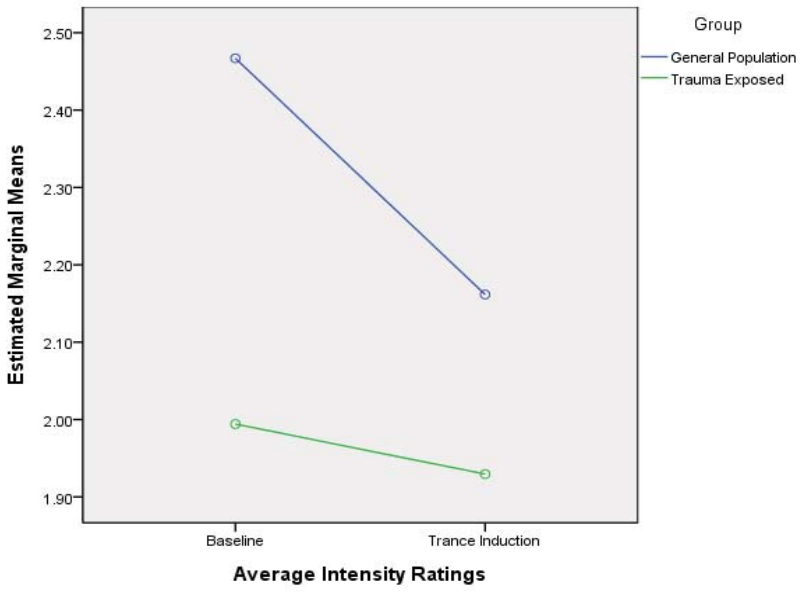

Figure 6.3. Interaction plot for the general population sample and trauma exposed sample on average intensity ratings scores across the baseline and trance induction conditions.

The third ANOVA analysed the low frequency component of HRV in both samples in both conditions. Results of the analysis revealed that there was no significant difference in the low frequency component between the baseline and trance conditions for the general population sample. Additionally, there was no significant difference for the trauma exposed sample in either condition. The results of the ANOVA approached but did not reach significance, $F(1, 47) = 3.21$, $p = .080$, partial $\eta^2 = .06$.

Finally, the fourth ANOVA examined the high frequency component of HRV in both samples in both conditions. The results revealed no significant difference in the high frequency component between the baseline and trance induction conditions for either the general population sample or trauma exposed sample. However, while not strictly significant, the interaction between the variables did closely approach (but not reach) significance $F(1, 47) = 3.74$, $p = .059$, partial $\eta^2 = .07$.

In conjunction with the ANOVAs reported above, a series of planned paired samples *t*-tests were conducted for each sample to test the hypothesis that affective self-regulation is intrinsically greater (and thus indices of emotional responsiveness would be lower) in the trance condition

than the baseline condition. Results revealed that for skin conductance, there was no significant difference between baseline and trance for either the general population sample, $t(29) = .08$, $p = .939$, $d = 0.01$ or the trauma exposed sample, $t(17) = -1.32$, $p = .205$, $d = -0.31$. For the average intensity ratings, participants in the general population sample differed in the ratings allocated between the baseline and trance conditions, $t(30) = 5.51$, $p < .001$, $d = 0.59$. The trauma exposed sample, however, showed no difference in their average intensity ratings between conditions, $t(19) = 1.46$, $p = .161$, $d = 0.11$. For the low frequency component of HRV, there were no differences between conditions observed for either the general population sample, $t(30) = -1.34$, $p = .192$, $d = -0.26$, or the trauma exposed sample, $t(17) = 1.12$, $p = .277$, $d = 0.40$. Similarly, no difference in the high frequency component was apparent between conditions for either the general population sample, $t(30) = -.75$, $p = .458$, $d = -0.13$, or the trauma exposed sample, $t(17) = 1.50$, $p = .152$, $d = 0.51$.

Table 6.2

Means and Standard Deviations for Skin Conductance, Average Intensity Ratings, and Low and High Frequency Components of Heart Rate Variability across the Baseline and Trance Conditions for the General Population and Trauma Exposed Samples

Variable	Sample	Condition	*M*	*SD*
Skin conductance	General Population	Baseline	-22.12	107.97
		Trance	-23.24	45.84
	Trauma Exposed	Baseline	-18.17	45.09
		Trance	-5.12	39.62
Average Intensity Ratings	General Population	Baseline	2.47	0.49
		Trance	2.16	0.54
	Trauma Exposed	Baseline	1.99	0.55
		Trance	1.93	0.57
Low Frequency HRV	General Population	Baseline	1508.65	1487.80
		Trance	1952.83	1911.49
	Trauma Exposed	Baseline	2397.67	3949.99
		Trance	1246.39	1401.17
High Frequency HRV	General Population	Baseline	2386.31	1943.12
		Trance	2671.14	2493.76
	Trauma Exposed	Baseline	3012.29	3332.02
		Trance	1666.07	1701.57

Note. HRV = Heart rate variability.

6.3.3 PLS Analysis

The PLS analysis extracted eight LVs of which two were found to be significant. LV1 and LV2 accounted for 30.88% and 24.85% of the cross-block covariance, respectively. Significance was measured by a permutation test which reassigns the order of conditions for each participant, resampling for 2500 iterations. PLS is recalculated in each instance to determine the random distribution of LV values enabling exact probabilities to be calculated for each of the obtained LVs. In this case, for LV1, $p = .003$ and for LV2, $p = .027$. The permutation test provides an objective method to determine the number of LVs with values strong enough to be significantly differentiated from random noise (Good, 2000; McIntosh & Lobaugh, 2004). The next step in interpretation is to examine the pattern of the design scores' LV weightings (similar to factor weights) across the experimental design conditions of each significant LV. Following this, significant bivariate correlations of the respective LV scores (similar to factor scores) with the other trait and affective response measures used in this study are presented for the key conditions and contrasts of each LV.

6.3.3.1 Latent Variable 1

The design scores for LV1 for the trauma exposed and general population samples are shown in Figure 6.6[30]. In this case, a very different pattern of weights is evident across conditions for the trauma exposed and general population samples. The largest differences for the trauma exposed sample are between the baseline high (positive design scores) and trance (absorption) high (negative design scores) conditions indicating that these individuals' LV1 scores (again similar to factor scores) will be significantly higher in the former condition (see standard error bars) than the latter. For this same contrast, the general population sample demonstrated the reverse pattern of design scores.

The electrode saliencies of LV1 are shown above the electrode labels in Figure 6.4. The topography of reliable saliencies shows that LV1 (corresponding to the effects above) is reliably expressed primarily at left and right fronto-temporal electrodes FT9 and FT10, central and parietal electrodes Cz, CP4, P3, and P4 and right temporal electrode P4. Significant saliencies occur late, primarily in the latter half of the epoch (post-500 milliseconds) and are essentially

[30] A correlation analysis revealed a significant result for sex and this LV in the trance high condition, $r = .37$, $p < .05$. This result indicates that sex may be playing a role in this LV and discriminating between groups, however, this requires further scrutiny that is beyond the scope of this thesis.

absent from the early sensory processing components of the ERP. Figure 6.5 shows the ERP of the LV1 score at right parietal electrode P4 for the occupational trauma exposure group in the baseline high condition (in blue) and trance high (in red) conditions. LV1 is clearly seen to differentiate between these conditions in precisely the late time window defined by the significant saliencies.

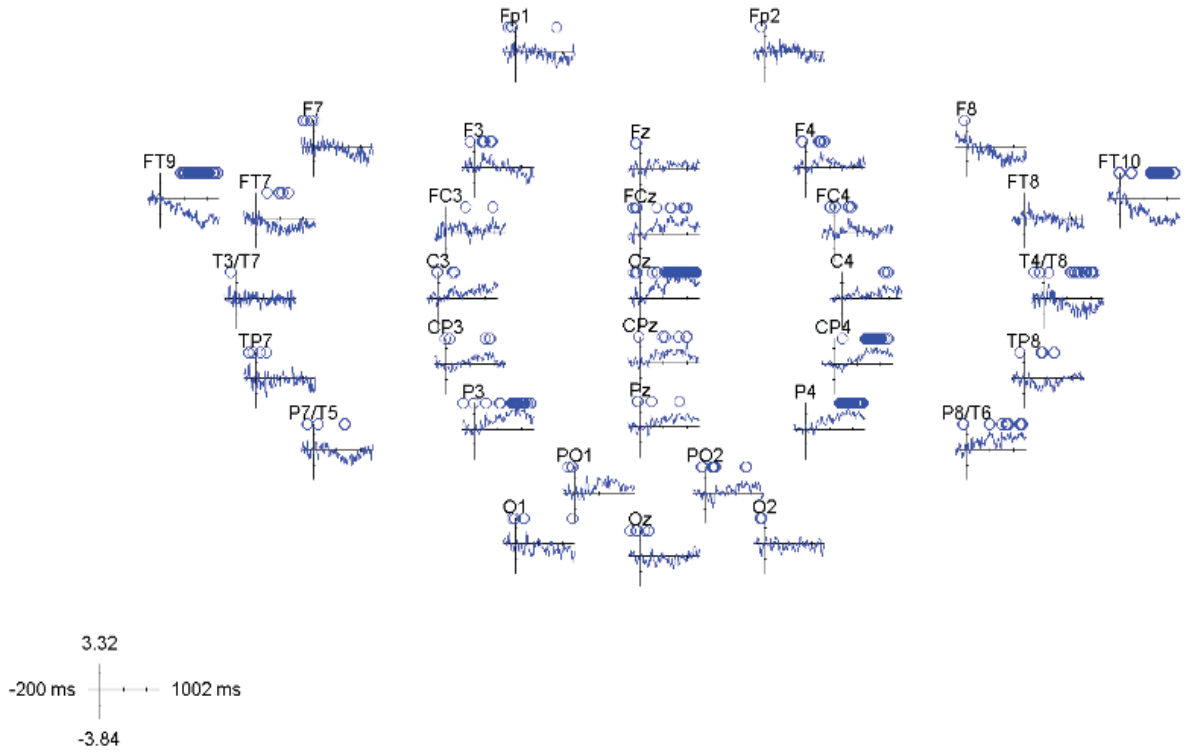

Figure 6.4. Electrode saliencies for LV1

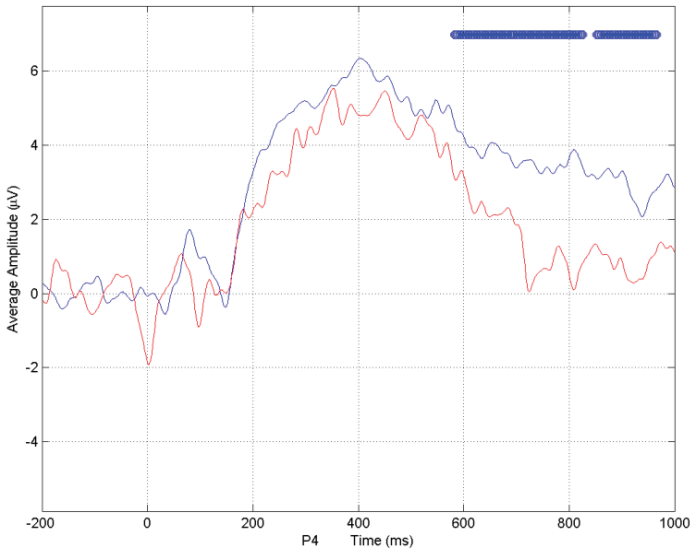

Figure 6.5. ERP of LV1 at right parietal P4 for the trauma exposed sample. The blue waveform indicates the baseline high condition and the red waveform the trance high condition.

Trauma Exposed Sample. Results of the correlations between the conditions and their contrasts which are identified by LV1 (i.e., baseline high [BH] and trance high [TH] conditions, and the difference score [BH-TH] between the baseline high and trance high condition) revealed a distinctive pattern of significant results for this sample. Because of the relatively small sample size (both here and below), statistical trends are reported in addition to formally significant results. While individual trends cannot be considered as accepted findings, they can play a legitimate role at this point in the identification of broader patterns (hypotheses for subsequent testing) contributing to the understanding of the functional nature of the cortical processing identified by each latent variable.

LV1 corresponds to a spatiotemporal pattern of the EEG; that is, to the activity of a distributed neural network, which appears to be to underlie changes between baseline and trance conditions in how this sample in particular processes the highly negative affective stimuli (i.e., those rated 3 or 4). LV1 scores for the baseline high condition significantly positively correlated (or neared significance) with four of the five PCI trance experience factors (Altered Awareness $r = .54$, $p = .055$; Negative Affect $r = .60$, $p < .05$; Positive Affect $r = .52$, $p = .072$; and Imagery $r = .68$, $p < .05$) revealing that the neural processes corresponding to LV1 bear a close relationship with the patterns of experience elicited by trance.

Even more important in this LV is the finding that the difference score between the baseline high and trance high conditions was highly negatively correlated with the average intensity ratings of the intensity of the negative affect experienced in response to stimuli in the baseline condition ($r = -.72$, $p < .01$) and neared significance in the trance condition ($r = -.51$, $p = .074$). This finding further highlights the impact of the trance induction on the operation of LV1. The greater the impact of this transition from baseline to trance, the lower the average intensity ratings given by this group, particularly in the baseline condition. This may be interpreted as a suppression of experienced affective response to observing distressing scenes and provides an important counterpoint to the ANOVA results in which the trauma exposed sample showed no significant difference in their average intensity ratings of the images from the baseline to the trance condition.

General Population Sample. The results of the correlation analyses for this sample are very different than for the trauma exposed sample. The main results revealed a significant negative correlation between the trance high condition and the Betts' QMI ($r = -.60$, $p < .01$) and a near significant relationship between the baseline high condition and the Betts' QMI ($r = -.42$, $p = .055$). This result indicates that in this group, the response of LV1 in the high intensity stimulus conditions is directly associated with the ability to deliberately form specific vivid mental images.

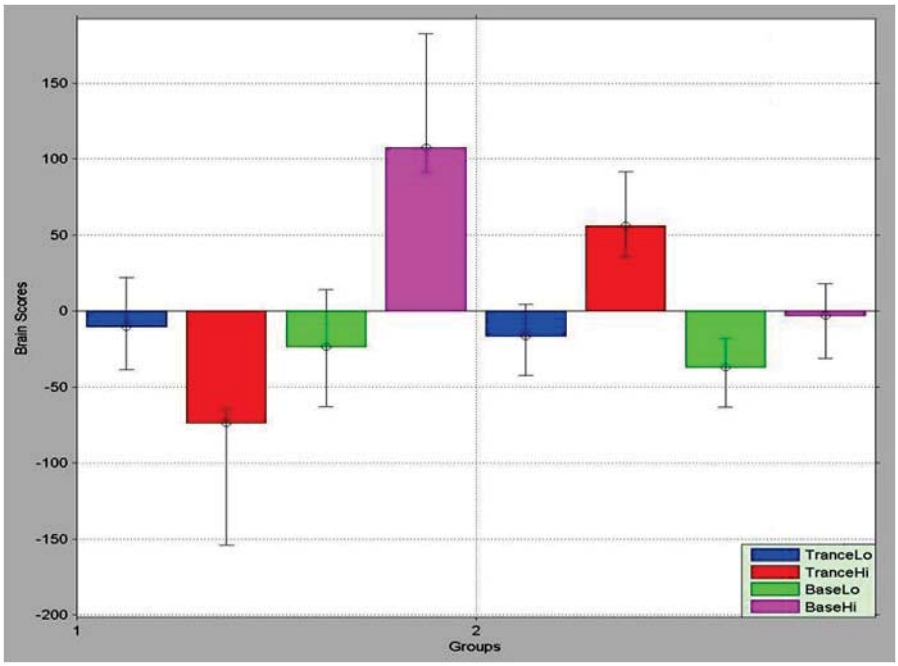

Figure 6.6. The brain (design) scores for LV1 for the trauma exposed (Group 1) and general population samples (Group 2). The graph indicates that for the trauma exposed sample specifically, the primary distinction is between the baseline high (BaseHi) and trance high (TranceHi) conditions. Error bars represent standard errors.

6.3.3.2 Latent Variable 2

The design scores for LV2 are shown in Figure 6.9[31]. In this case the contrasts between conditions are essentially similar in both experimental groups. However, the magnitude of these contrasts is clearly greater in the trauma exposed sample. The largest differences are consistently between the trance high (positive design scores) and baseline low (negative design scores) conditions. Given the similar pattern for the two samples, with the trauma exposed sample showing a larger effect, correlations were calculated on the two samples combined in addition to separately for each sample. LV2 corresponds to a neural process responding to negative affective

[31] A correlation analysis revealed a significant relationship between sex and this LV in the trance low condition, r = .42, $p < .05$. However, as may be seen in Figure 6.9, this relationship is not playing a role in distinguishing between groups or conditions. Additional correlation analyses revealed significant relationships between age and LV2 in the trance high condition, r = -.34, $p < .05$ and between age and LV2 in the baseline high condition, r = -.37, $p < .05$. While the former result is indicative of younger people having greater responses to high intensity images, this relationship (and the latter result) is not related to group differences or discriminating between conditions.

stimuli which is modulated by the transition from baseline to trance in a distinctive way for lower and higher intensity stimuli, respectively. Thus the contrasts picked out by LV2 are defined by the transitions from the conditions of baseline low (BL) to trance low (TL), baseline high (BH) to trance high (TH), and, most distinctively, from baseline low to trance high.

The electrode saliencies of LV2 are shown below the electrode labels in Figure 6.7. The topography of reliable saliencies shows that LV2 is reliably expressed across all frontal electrodes from left to right. The parieto-occipital and the right temporal regions also feature prominently in the topography of reliable LV2 saliencies. Although dependent upon topography, the time window of significant LV2 saliencies generally starts much earlier than those of LV1. Figure 6.8 shows the ERP of the LV2 score at the right occipital electrode O2 for the occupational trauma exposure group in the trance high condition (in blue) and baseline low (in red) conditions. Here, LV2 can be seen differentiating between these conditions in the earlier time window of 200 – 400 milliseconds corresponding to the significant saliencies.

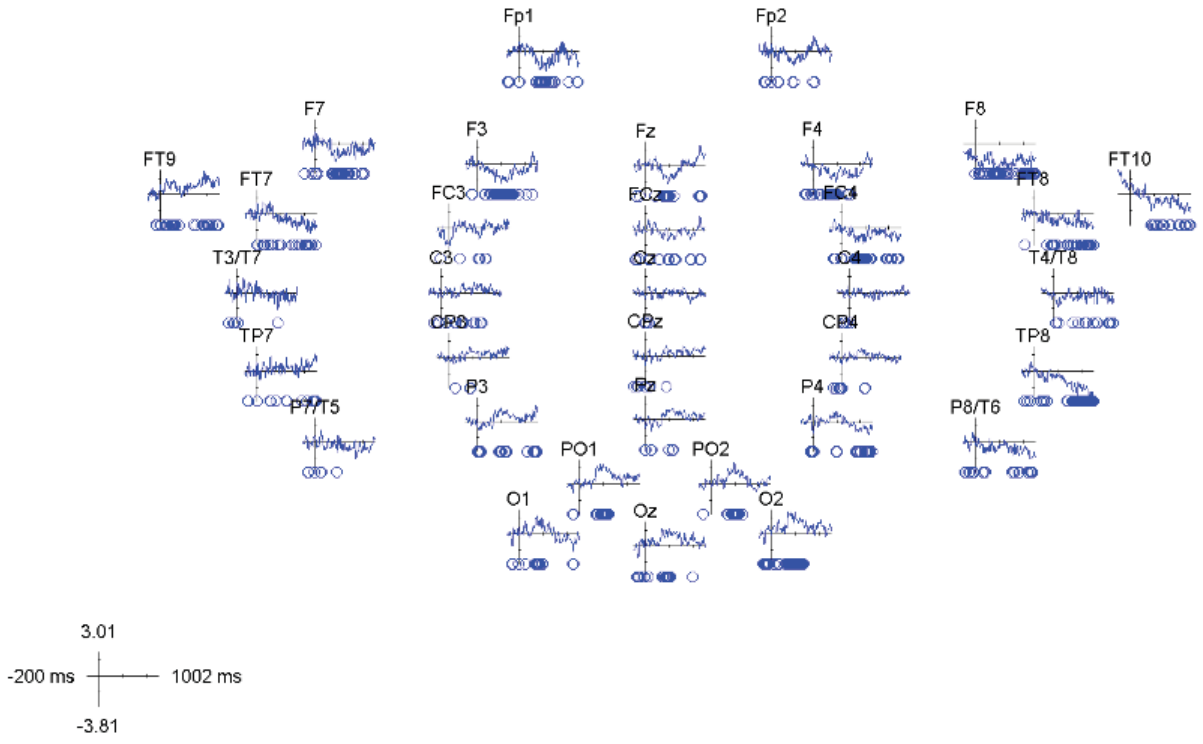

Figure 6.7. Electrode saliencies for LV2.

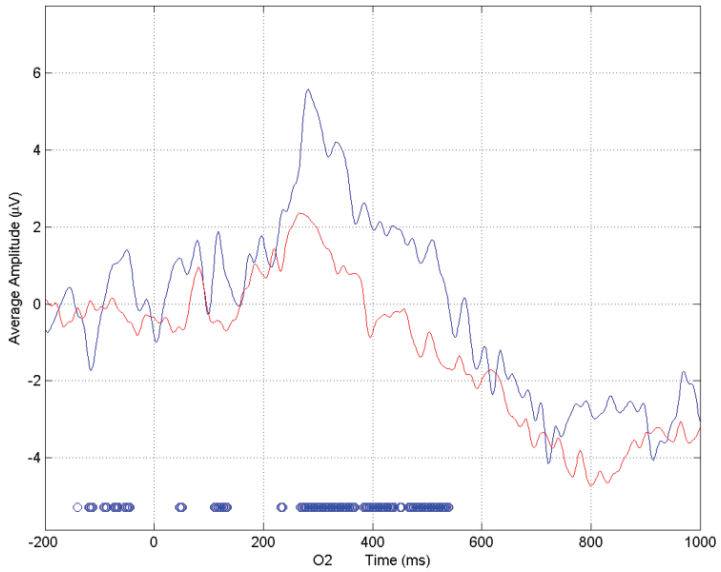

Figure 6.8. ERP of LV2 at right occipital electrode O2 for the trauma exposed sample. The blue waveform indicates the trance high condition and the red waveform the baseline low condition.

Trauma Exposed Sample. The principal results for the correlations between the conditions and contrasts defining LV2 and the main study variables again reveal highly informative results for this sample. Significant (or near significant) correlations were found between the difference score (TH-BL) corresponding to the contrast between baseline low to trance high and three of the five PCI trance experience factors (i.e., Altered Awareness $r = .71$, $p < .01$; Negative Affect $r = .53$, $p = .064$; and Self-Control $r = -.78$, $p < .01$). In this group, the extent to which trance induction and stimulus intensity combine to impact on the operation of LV2 is very closely tied to the extent of dissociation-like experiences as well as the experience of negative affect during the trance induction.

Also of major importance were the correlations between the difference score (TL-BL) corresponding to the transition from baseline low to trance low and the low frequency (LF) component of HRV in the trance condition ($r = .72$, $p < .01$), and the difference score (TH-BH) corresponding to the transition from baseline high to trance high and the high frequency (HF) component of HRV in the baseline condition ($r = -.54$, $p = .084$). The first relationship reveals that the greater the shift in LV2 from baseline to trance, the greater the influence of an individual's autonomic regulation (largely sympathetic) over their heart rate in the trance condition (Appelhans & Luecken, 2006). The second result implies that the larger the transition

from baseline to trance, the smaller the HF (parasympathetic) modulation of heart rate in the baseline condition.

General Population Sample. As in LV1, there was a significant negative correlation between the trance high condition and the Betts' QMI ($r = -.51$, $p < .05$). Additionally, a significant negative relationship was found between the baseline low condition and the Betts' QMI ($r = -.61$, $p < .01$), again revealing that for this group, in the conditions sensitive to the LV, individuals' LV scores are directly related to their abilities to form vivid mental images.

Combined Sample. In the combined sample, results revealed significant relationships between conditions and contrasts defined by LV2 and three of the four abuse types recalled on the CATS. For instance, the trance high and baseline low conditions both had significant negative relationships with neglect ($r = -.40$, $p < .05$ and $r = -.37$, $p < .05$, respectively). In addition, baseline low negatively correlated with physical abuse ($r = -.41$, $p < .05$). The recall of neglect and physical abuse in childhood are inversely related to the response of LV2 in these conditions. However, a positive relationship was found between the difference score (TL-BL) corresponding to the transition from baseline low to trance low and physical abuse ($r = .42$, $p < .05$). This result is mirrored in the trauma exposed sample ($r = .52$, $p = .067$). Additionally, the difference score (TH-BH) corresponding to the transition from baseline high to trance high significantly positively correlated with sexual abuse ($r = .36$, $p < .05$) and this parallels the same relationship in the general population sample ($r = .39$, $p = .082$).

Also highlighted in these results were the correlations found between the baseline low condition and the ICMI-F, including the total score ($r = .34$, $p = .053$), and the altered state ($r = .33$, $p = .058$) and vivid fantasy ($r = .40$, $p < .05$) subscales. These results reveal that fantasy proneness has a positive relationship with the neural responses corresponding to LV2 in the baseline low condition. Additionally, the difference score (TH-BL) corresponding to the transition from the baseline low to trance high conditions negatively correlated with the same three variables ($r = -.31$, $p = .071$; $r = -.30$, $p = .083$; and $r = -.35$, $p < .05$, respectively) indicating that the more LV2 increases from baseline low to trance high, the lower was an individual's trait fantasy involvement.

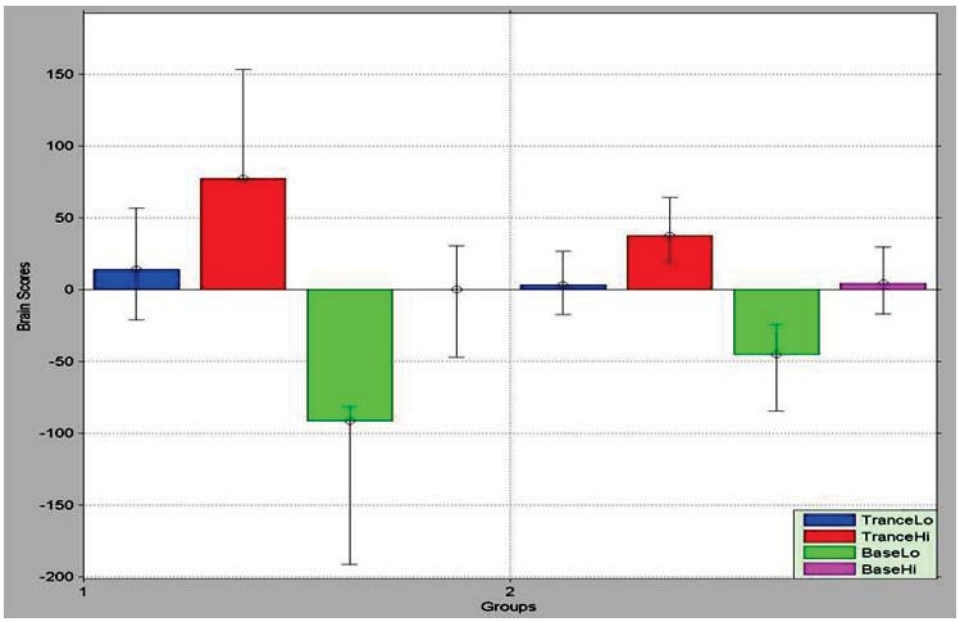

Figure 6.9. The brain (design) scores for LV2 for the trauma exposed (Group 1) and general population samples (Group 2). The graph indicates that the primary distinction is between the baseline low (BaseLo) and trance high (TranceHi) conditions for both groups. Error bars represent standard errors.

6.4 Discussion

In the current study, the emotional response to a traumatic episode was simulated by having participants view a series of negative affective stimuli whilst recording subjective, autonomic nervous system (i.e., skin conductance and heart rate), and central nervous system (EEG) responses. As in Study 3, the broad aim of this study was to examine the role of trance-like dissociation in emotional responses to these images and to identify the neural processing networks responsible. Two samples of participants (trauma exposed and general population) were recruited, and their responses measured under the baseline and trance conditions utilised in Study 3. Previous research on vicarious traumatisation and occupational exposure trauma has found that individuals whose professions place them in harm's way and/or exposes them to frequent violence and unpredictable aversive events do not always walk away unscathed. Rather, research indicates that these individuals experience outcomes similar to those who are the actual victims of trauma (e.g., Genest et al., 1990; Lamontagne, 1983). Thus as a group, the trauma exposed sample was a useful comparison to the general population sample who, while not screened for

trauma exposure, were not at elevated risk for trauma (let alone chronic exposure to trauma) in their day-to-day lives. Comparison of these groups allowed for the examination of the role of dissociation in the coping mechanisms and central processing of traumatic affective material that develop as a long-term response to adult trauma exposure.

6.4.1 State and Trait-Like Dissociations and Trance-Related Changes in Emotional Regulation

The first analysis in this study examined the relationships between state and trait measures of trance-like dissociation considered in Study 3 and the four change score variables (i.e., the difference between the baseline and trance conditions) specifically created for this study (skin conductance, average intensity ratings, and the high and low frequency components of HRV). The most important findings were those associated with the average intensity ratings change score and the CATS abuse subtypes (Sanders & Becker-Lausen, 1995). Notably, the results revealed a significant positive association between the intensity ratings change score and recalled sexual abuse ($p < .05$) and a trend for recalled emotional abuse ($p = .073$), but no relationship with either recalled physical abuse ($p = .482$) or recalled neglect ($p = .564$). This result (i.e., the link between recalled sexual and emotional abuse) and trance-related (dissociative) modulation of negative affect is not one that has been previously demonstrated. However, some researchers have proposed a link between physical abuse and sexual abuse[32] as a threat to the physical integrity to the body and, as such, one of the potential pathways to the development of somatoform dissociation (e.g., Nijenhuis, 2000). Additionally, it has been suggested that emotional abuse and neglect are more or less connected based on the (incorrect) assumption that they are somehow "lesser" forms of abuse (e.g., Hart & Brassard, 1987; Tomison & Tucci, 1997). Other researchers have highlighted additional links between emotional abuse and neglect and between physical and sexual abuse. For example, Glaser (2000, p. 98) claimed that "…physical abuse and sexual abuse are in the nature of *events*…" whereas "…neglect and emotional abuse characterise the *relationship* between carers and the child." So has been the state of prior research on the relationships between the various forms of abuse. However, the results of the current study seem to cut across these conceptual models and suggest that these earlier approaches may need to be redrawn.

[32] As noted in Chapter 5, Table 5.2, sexual abuse and physical abuse were not significantly related ($r = .25$, $p = .082$).

While all forms of abuse may be considered a threat to the attachment relationship[33], sexual abuse and emotional abuse may in fact be regarded as more immediately associated with distress at the interpersonal relationship between child and caregiver, while neglect and physical abuse are more immediately associated with threats to the physical wellbeing of the child. Emotional abuse and sexual abuse may be considered as most directly inducing interpersonal or relational *hurt* in the victim. In particular, these types of abuse most directly threaten the thriving of the child. Hart and Brassard (1987) make the claim that psychological maltreatment is inherent in all forms of abuse and it is this which is the "major threat to children's mental health." Thus the loss of trust which evolves from both emotional and sexual abuse could quite reasonably be considered "psychological maltreatment" and it is these forms of abuse which are "…even more potentially damaging than direct physical abuse or neglect alone" (Somer & Braunstein, 1999, p. 449). Children who experience these forms of mistreatment learn that caregivers are the perpetrators of abuse and not to be trusted. It thus alters their sense of self and way of viewing the world. Feinauer (1989) argued that when the attachment bond between child and caregiver is violated, this results in feelings of betrayal by the victim. The threat to the attachment relationship is therefore the crucial element in the development of the feelings of distress felt by the child toward the perpetrator of sexual and emotional abuse.

While all forms of abuse plausibly engender emotional hurt and betrayal, neglect and physical abuse are rightly perceived by the child as a direct threat to their physical integrity. That is, these forms of abuse directly induce *physiological* distress through actual bodily harm. In fact, severe physical harm may result from a caregiver neglecting to ensure the safety of the child.

In summary, the data presented here seem to point in a different direction to that of previous research and so this alternative account (an association between emotional abuse and sexual abuse but not physical abuse and neglect with dissociative blunting of negative affect) will need to be attended to more carefully (and hopefully resolved) by future research. The results presented here force us to rethink what is common and what is distinct about the reaction to

[33] Freyd (e.g., 1994, 1996) discusses the theory of betrayal trauma which states that the dissociation of information from the individual's awareness is mediated by how threatening that information is to their attachment relationships (DePrince & Freyd, 2004). She states: "…the degree to which a trauma involves betrayal by another person significantly influences the traumatized individual's cognitive encoding of the experience of trauma, the accessibility of the event to awareness, and the psychological as well as behavioral responses" (Freyd, 1996, pp. 9-10).

different types of abuse as it relates to dissociative processes and coping responses to trauma-related distress.

Additional findings from the correlation analyses uncovered a significant positive relationship between the average intensity ratings change score and the vivid fantasy sub-dimension of the ICMI-F ($p < .05$) as well as with the PCI factor Altered Awareness ($p < .05$). This finding indicates that the more people experienced alterations in their state of awareness during trance induction and a predisposition for vivid imaginative involvements, the lower were their feelings of distress when viewing traumatic images in the trance condition relative to the baseline condition. These results highlight the impact that the trance induction has on the self-regulation of individuals' emotional responses as expressed in their experiential ratings. Moreover, it indicates that the trance induction elicited a change, closely resembling the form of dissociative experience called detachment, in which participants rated their distress on viewing negative affective images as significantly less than in the baseline condition.

Additional results of interest in this analysis included the negative significant relationship between the skin conductance change score and the PCI factor Imagery ($p < .05$) indicating that the more reactive (i.e., less modulated) the skin conductance in the trance condition relative to the baseline condition, the lower the amount and vividness of imagery elicited by the trance induction. In other words, the greater was the modulation of the skin conductance response in the trance condition relative to the baseline condition, the greater was the imagery reported during the trance induction. Additionally, both the low frequency and high frequency components of HRV exhibited significant negative relationships with the PCI factor Altered Awareness (for both $p < .05$), indicating that the greater the drop (i.e., more positive the change score) in the regulatory influence of these components on heart rate, the lesser was the experience of alterations in awareness during the trance induction (and vice versa).

Overall, the results of the correlation analysis reveal the impact that the trance induction has on the self-regulation of responses to negative affective stimuli. Which group differed on which variables, however, was the focus of the follow-up ANOVAs.

6.4.2 The Difference between the Trauma Exposed and General Population Samples in the Baseline and Trance Conditions

In the mixed model ANOVAs conducted as a follow up to the initial correlation analyses, the responses of the trauma exposed and general population samples on the skin conductance, average intensity ratings, and low frequency and high frequency change scores were compared between the baseline and trance conditions. Results of this analysis uncovered significant differences between the groups in the two conditions with respect to the average intensity ratings change score but no significant changes for skin conductance and HRV responses.

The change in the average intensity rating scores from the baseline to the trance condition revealed a significant reduction in the affect intensity ratings by participants in the general population sample in contrast to the stability shown by the occupational trauma exposure sample. This result demonstrates the effect of the trance induction in modulating the experience of negative affect shown by the general population sample in the trance condition. That is, in the trance condition relative to the baseline condition, the affect ratings were, on average, lower. Thus for the general population sample, their feelings of distress when viewing the images were reduced following the trance induction.

It is important to consider some of the alternative explanations for these results which do not suppose that the trance induction was itself responsible for the changes observed. However, it will be argued that on closer scrutiny, these alternative explanations are not plausible. The first possibility is that what is really being revealed is no more than a habituation effect as the experimental paradigm stipulated that one condition immediately follow the other. That is, after viewing one series of images in the baseline condition, participants in the general population sample were no longer surprised or distressed by the images in the trance condition. However, this claim is unlikely. There is no evidence of habituation here as there was no significant reduction in skin conductance between the baseline and trance conditions in either group as the planned comparisons between the two conditions were nonsignificant (and indeed far from significance) in both groups. This supports Codispoti et al.'s (2006, 2007) and Bradley et al.'s (1996) findings that individuals repeatedly presented a series of visual stimuli with the same affective valence do not necessarily demonstrate diminished emotional reactions. A second explanation for these results might be that there was a fundamental difference in the two sets of images presented to the participants, hence the contrast in ratings given between the two

conditions. Again, this claim may be disputed. The majority of the images selected for presentation (67.5% and 75%, respectively, for the baseline and trance conditions) were sourced from the IAPS database (Lang et al., 2005) and were closely matched on their normative valence and intensity ratings. Additionally, the paired samples *t*-test conducted in Chapter 5 revealed no significant difference between the average valence ratings for the two sets of images ($p = .661$).

Thus it appears that at a conscious level, the trance induction had an effect on the general population sample resulting in a systematic reduction in their average intensity ratings of the negative affect evoked by the experimental stimuli between the baseline and the trance conditions. The trauma exposed sample, on the other hand, already had lower average intensity ratings than the general population sample and so it appears in this study that their experience of negative affect was less affected by the trance instructions (suggesting a floor effect). It is therefore possible that this sample were relying on self-regulatory mechanisms unrelated to trance induction to reduce their feelings of distress when viewing the images. However, as will be discussed, the results of the PLS provide strong evidence to reject this interpretation. Thomas (2009) discussed the importance of developing capabilities (i.e., strategies) in front-line workers that will allow them to cope with the situations they are potentially going to be confronted with in their occupations before they actually face them. Organisations such as the police, fire, and ambulance services need to be vigilant in their promotion of and education in resilience training in their workforce in order to prevent issues such as burnout and vicarious traumatisation.

6.4.3 The Relationship between Neural Activity and Trait and Affective Response Measures

The PLS analysis was conducted in order to identify the activity of central mechanisms responsible for trance-like (dissociative) differences in processing negative affective stimuli and to identify their relationship to differing patterns of trauma exposure. The analysis extracted two significant LVs which were further examined in a series of correlation analyses between the conditions (baseline low, baseline high, trance low, trance high) and contrasts, in the two samples, defined by the design scores of each LV. Both LVs appeared to correspond to central affective processing networks which are highly responsive to the impact of the trance induction on the modulation of responses to negative affective images of differing intensities.

6.4.3.1 Latent Variable 1

For both groups, LV1was found to correspond to an affective processing network responding primarily to high intensity negative stimuli but clearly discriminated in activity between the baseline and trance conditions. However, a very different pattern of effects was obtained for the two groups of participants. For the trauma exposed sample, it was found that LV1 responds most strongly to high intensity stimuli in the baseline condition and least strongly in the trance condition. For the general population sample, the response of LV1 also discriminated between baseline and trance conditions for high intensity stimuli in this group; however, LV1 was most responsive in the trance condition rather than the baseline condition. For the occupational trauma exposure group, correlation analyses found significant (or trend) associations between the PCI trance factors Altered Awareness, Negative Affect, Positive Affect, and Imagery and individuals' LV1 scores in the baseline high condition (the most strongly discriminated condition by LV1). It is a remarkable coherent pattern, in light of the hypothesised relationship between the central processing of traumatic material and trance-like dissociation in awareness, that the operation of this LV *in the baseline condition* is independently related to the descriptive patterns of experience elicited during the later trance induction.

Additionally, the difference in LV1 scores between the baseline high and trance high conditions was negatively associated with the average intensity ratings of the stimuli (that is, the experienced negative affect) in the baseline condition and neared significance in the trance condition. This finding indicated that the greater was the impact of the trance induction on the neural processes corresponding to LV1, the lower were the average intensity ratings of the trauma exposed sample in both baseline and trance conditions (more so in the baseline condition). This finding was interpreted as LV1 functioning to suppress the subjective awareness of intense negative affect. Note that this neural response (LV1) contrasts sharply with that of subjective awareness as seen in the ANOVA (and planned comparison) which showed no significant difference for the trauma exposed sample in their average intensity ratings from the baseline to trance condition. In this sample, LV1 exhibited greatest responsiveness to high valence negative images in the baseline condition.

For the general population sample, however, without this learning history, LV1 was more responsive to high valence stimuli in the trance condition than the baseline condition. In this group, the only significant relationship of LV1 was a negative association with the Betts' QMI in

the trance high condition, indicating that in this condition, most distinctive for the operation of LV1 in the general population sample, the ability to form clear mental images may play an important role in its function.

6.4.3.2 Latent Variable 2

For LV2, the pattern of the design scores (the projection of the LV2 into the conditions of the experimental design) was essentially the same for the two groups. Participants' LV2 scores were highest in the trance high condition and lowest in the baseline low condition for both groups. Additional contrasts showing differences in the operation of LV2 were between baseline low and trance low, and between baseline high and trance high conditions (LV2 becoming more responsive in the trance condition in each case). However, the magnitude of these effects was clearly larger for the occupational trauma exposure sample than the general population sample (see Figure 6.9). Because the pattern of the design scores was primarily the same, investigative correlations were calculated for the trauma exposed and general population samples both separately and together in combination.

For the occupational trauma exposure sample, the (maximal) difference in affective processing response of LV2 between the baseline low and trance high conditions demonstrated a not only significant, but remarkably strong, positive relationship with the PCI trance factor Altered Awareness (r = .71) and an even stronger negative relationship with PCI factor Self-Control (r = -.78). This result indicates that stimulus intensity and trance induction operate in conjunction with the affective processing response of LV2 and this is tied *very* closely to the dual aspects of dissociative phenomenology argued to correspond to the operation of Tellegen's (1981) experiential and instrumental mental sets during the trance induction as identified in Studies 1 and 2.

Also of major importance in these results was the finding of a significant positive relationship between the difference score corresponding to the transition from baseline low to trance low and the low frequency component of HRV in the trance condition. This relationship reveals that the greater the shift in LV2 from baseline low to trance low, the *greater* is sympathetic modulation of heart rate (Sztajzel, 2004) in the trance condition. In addition, a trend was found for the relationship between the difference score corresponding to the transition from baseline high to trance high and the high frequency component of HRV in the baseline condition. This

relationship reveals that the greater the shift from baseline high to trance high, the *smaller* the parasympathetic modulation of heart rate in the baseline condition. This result reveals that the change in affective regulation governed by LV2, in the transition from baseline to trance conditions appears to have a distinctively different relationship with the high frequency (parasympathetic) and low frequency (sympathetic) components of HRV, respectively. In Study 3, both the low and high frequency components of HRV in the trance condition were found to be associated with the trait of fantasy proneness. In the current study, however, the two components appear to have a distinct relationship to the changing modulation of emotional responses from baseline to trance (low frequency in trance and high frequency in baseline). This coheres with the literature which supports the contention that the two components are independent but functionally related (e.g., Appelhans & Luecken, 2006).

As with LV1, the interpretation of the correlations for the general population sample is less straightforward. Again, a significant negative correlation was found between the Betts' QMI and both the trance high and baseline low conditions, indicating that LV2 is related to individuals' abilities to form vivid mental images for the general population sample in these conditions.

The primary findings for the combined sample involved the LV scores in the contrasts and conditions defined by the design weights of LV2 and the CATS subscales of recalled neglect, physical abuse, and sexual abuse. The trance high and baseline low conditions negatively correlated with neglect, while baseline low negatively correlated with physical abuse indicating that the recall of these types of abuse in childhood are contrary to the affect-modulating response of LV2 in these conditions. The difference score corresponding to the transition from baseline low to trance low was found to positively correlate with physical abuse and this relationship was also reflected in the occupational trauma exposure sample. Moreover, the difference score corresponding to the transition from baseline high to trance high was positively associated with sexual abuse and the parallel relationship was also seen in the general population sample. These results indicate that the greater the activation of LV2 in the transition from baseline to trance, the greater the recall of these types of abuse in childhood.

Finally, LV2 in the baseline low condition was found to positively correlate with the ICMI-F total score and two subscales (i.e., altered state and vivid fantasy) indicating that fantasy proneness is associated with the neural responses corresponding to LV2 in this condition. Surprisingly, the difference score corresponding to the transition from baseline low to trance high

negatively correlated with the same variables indicating that the greater the combined effect of stimulus intensity and trance instruction, the lower an individual's involvement with fantasy experience.

6.4.4 Limitations

A major limitation in the current study is the size of the samples investigated (n = 20 and n = 31 for the trauma exposed and general samples, respectively). Realistically, the logistics of psychophysiological recording place large sample studies, on the scale of questionnaire and interview studies, beyond the scope of this project. This is so for both the recruitment and retention of participants and for the potential vulnerability of statistical analyses such as the PLS to missing data. It should be noted, though, that the PLS can be utilised with modest sample sizes. Nevertheless, future research should aim to enlarge the sample on which such inferences are drawn and upon which they are tested.

Another limitation is that a university based (mainly student) sample was employed as the comparison group to the trauma exposed sample. Concerns are often raised about the generalisability of student samples to the population at large. For instance, Wintre, North, and Sugar (2001) found that there appears to be an over-reliance of student participants (undergraduates, in particular) in psychological research. As a group, student samples tend not to be representative of the wider community given that a great deal of research is conducted on first year students still in adolescence. This, according to Wintre et al. (1996, p. 222), ignores all of the "…capabilities and problems of mature individuals." Thus it behoves the researcher to be aware of this matter when both recruiting participants and attempting to generalise results.

The absence of counterbalancing in the order of baseline and trance conditions leaves open the possibility of order effects in the results from these conditions. However, in two previous studies using EEG to measure neural activity in relation to another trance induction procedure (hypnotic induction) which adopted an A-B-A design, it was found that pre- and post-trance EEG measures were not equivalent (Jamieson, Dwivedi, & Gruzelier, 2005; Williams & Gruzelier, 2001), with post-trance measures more closely resembling trance measures than pre-trance measures. Therefore it was decided that adoption of a pre-trance baseline measure was less likely to introduce distorting order effects in the EEG-derived measures than conventional counterbalancing. This issue may be better addressed by counterbalancing order of conditions

across two separate sessions on different days (or an A-B-A design on three separate days), although this remains to be determined by empirical studies. However, this option was not logistically feasible in this instance.

6.4.5 Conclusion

The current study demonstrated the utility and value of trance induction instructions in the modulation of negative affect in response to viewing negative affective images of varying intensity. This was seen prominently in the results of the correlation analysis in which the change in average subjective ratings of the presented images between the baseline and trance induction conditions was found to be positively associated with both fantasy proneness and the PCI factor Altered Awareness, indicating that the trance induction resulted in experiences similar to those described elsewhere as core aspects of clinical dissociation. Thus the administration of trance induction instructions was accompanied in individuals with relevant aptitude by the experience of alterations in awareness as well as vivid imaginative involvement and who rated the traumatic images presented as less distressing than in the baseline condition. Support for the contention that the effects of trance induction on central affective processing are linked to dissociative processes was provided by the PLS analysis. Trance and stimulus intensity where found to jointly impact the operation of LV2. For the occupational trauma exposure group, the difference corresponding to the contrast between baseline low and trance high was positively associated with the PCI factor Altered Awareness (experiential mental set) and negatively associated with Self-Control (instrumental mental set) to a very high magnitude. Evidence has been presented across this thesis that these two PCI trance factors parallel Tellegen's (1981) experiential and instrumental mental sets and represent distinct (but not necessarily unrelated) components of trance-like dissociation in experience.

Results of the ANOVA revealed that at a conscious level, those with occupational trauma exposure reported considerably less negative affect in response to the images viewed than did those in the general population sample. This suggests a history of long-term exposure to traumatic events in adults fosters the development of affective regulation mechanisms which modulate the conscious experience of negative affect. Presumably such mechanisms operate unconsciously, at a neural level, to self-regulate emotional responses to such traumatic events. In addition, the occupational trauma exposure sample showed much greater stability in their experienced responses between the baseline and trance conditions than did the general population

sample. The trance induction itself appeared to modulate the experience of negative affect in the general population sample as their average subjective intensity ratings of the images were lower in the trance condition than the baseline condition. Arguably, corresponding results for the occupational trauma exposure group may have demonstrated a floor effect. The neural mechanism hypothesised to modulate the experience of negative affect in the trauma exposed group was able to be identified with LV1 from the PLS analysis which design scores showed was itself highly sensitive to trance induction in the case of high intensity negative stimuli. It was found that the sensitivity of LV1 to this contrast (BH-TH) was both significantly and substantively related to *lower* overall ratings of the experience of negative affect responses in *both* the baseline and the trance induction conditions.

In summary, the current study revealed the presence of trance-related regulation of emotional responses to traumatic images at the level of central nervous system, autonomic nervous system, and experience which were in turn linked with dissociative phenomenology in the trance condition. In turn, the operation of these dissociation-linked affective response systems were found to be systematically linked to occupational trauma exposure and specific patterns of recalled childhood abuse. Future research needs to address three issues in particular arising from this study.

First, the results pertaining to the association between the two abuse types, emotional and sexual, with dissociative phenomenology and emotional self-regulation responses linked to the experiential mental set have not been reported in the literature. They contrast with the related pattern of results observed in Study 3 where neglect and physical abuse appeared more closely linked to factors otherwise associated with the operation of the instrumental mental set. If sustained, this pattern of findings is of great importance to causal models of the link between reports of childhood trauma and later dissociation. It therefore merits further investigation and resolution.

Second, although the topography and timing of significant bootstrapped LV saliencies (akin to factor weightings) in the EEG data set provide a unique neural signature identifying the operation of each LV across the experimental conditions, the specific cortical networks generating these scalp patterns have not been identified here. The LVs identified by PLS correspond to spatially distributed functional networks of cortical activity rather than highly localised modular processes (such as motion detection). Arguably, the most accurate method to reconstruct the network of

cortical sources corresponding to each LV is standardised Low Resolution Electromagnetic Tomography (sLORETA; Pascual-Marqui, 2002). sLORETA is an EEG source localisation method based on a mathematical approach specifically designed to reconstruct distributed networks of cortical sources which discriminate between experimental conditions. Although beyond the scope of this thesis, sLORETA could be applied to the reconstructed LV scores (similar to the calculation of factor scores) projected into EEG data space in order to estimate the cortical sources underlying differences in the operation of an LV between key experimental conditions. This analysis is currently planned for this data set.

The strongest expression of LV1 was in the occupational trauma group in the baseline high negative valence condition, yet the strongest phenomenological measure correlated with LV1 for this group in this condition was for (subsequent) PCI trance Imagery. It may have been the case that the strong LV1 response at baseline triggered greater imagery in the immediately following trance induction. For the group chosen to represent the general population, imagery vividness as measured by the Betts' QMI (1967) was significantly associated with the magnitude of LV1 and LV2 in each of the design conditions maximally discriminated by those respective affective response processes. Thirdly, the possible role of mundane imagery (e.g., as a source of distraction), as distinct from specific trance and/or dissociative processes, in the modulation of these central affective responses mediated by LV1 and LV2 has not been ruled out by these results and requires careful further investigation.

CHAPTER 7

CONCLUSIONS

7.1 Introduction

The broad theme of this thesis was the investigation of the role of trance-like dissociation in response to traumatic experience. This involved, in the first instance, investigating the phenomenology of absorption states induced by a standardised trance instruction. These states were investigated as a potential experimental analogue of the range of dissociative states reported in the clinical literature. This aim was achieved by examining the factor structure of the Phenomenology of Consciousness Inventory (PCI; Pekala, 1991a), an instrument for measuring the variability of trance-related experiences. As a result, five factors of trance-related experience were identified. The next step in this thesis was to identify the relevant traits or abilities underpinning the different patterns of experience emerging from an absorption state or trance induction. These traits included the ability to become absorbed in inner-generated imaginings and the ability to clearly and vividly generate specific images. These traits were then investigated in relation to how individuals respond when confronted by stimuli deemed aversive or distressing. Determining how dissociation may be involved with individuals' ability to regulate aspects of their emotional response in the face of such threat was the ultimate aim of this program of research. Exposure to trauma is a significant threat to individual wellbeing. Gaining insight into these responses is especially relevant to the long-term wellbeing of the many individuals who are routinely faced with traumatic events as a result of their occupations. Thus the goal of this thesis was to extend prior research on the role of trance-like dissociations in experience and emotional responses to trauma. This was achieved via four experimental studies. Studies 1 and 2 concentrated on the area of trance experience and examined associations with relevant trait abilities in a student population. Study 3 examined the links between reports of childhood exposure to trauma, trance-like dissociative mechanisms, and the autonomic and subjective components of the emotional responses of a group of participants to a series of negative affective stimuli, employed as an experimental analogue of exposure to trauma in both a baseline and trance induction condition. Finally, Study 4 extended the logic of Study 3 to include central nervous system processes responsible for regulating these same emotional responses to examine the operation of dissociation-related coping mechanisms in two groups of participants: a general population sample comprised principally of university students, and a sample with continuing

adult exposure to trauma comprised chiefly of emergency service workers. Study 4 employed the averaged event-related potential (ERP) responses averaged across participants' subjective ratings of low and high intensity traumatic stimuli, respectively, in order to identify and investigate the operation of neural networks regulating their emotional responses.

This thesis has endeavoured to augment current scholarship by investigating the experience of dissociation in an innovative manner. Much of the study of dissociation revolves around the use of the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986) as a trait measure, an instrument *not* utilised in this thesis. While this approach has proved fruitful, it has also become controversial. There is now a need for it to be supplemented with state measures, where dissociative experiences are actually elicited in order to more fully investigate the operation of dissociative processes. This was achieved through the use of the PCI as a state measure of trance-like experience and the Modified Tellegen Absorption Scale (MODTAS; Jamieson, 2005) and the Inventory of Childhood Memories and Imaginings-Frequency Format (ICMI-F; Fellows & Wright, 1989; Hough, 2006) as additional trait measures potentially related to dissociative experiences in this program of research. Ultimately, this thesis aimed to highlight the utility of this alternative approach in order to complement and critically extend previous programs of research.

7.2 The Research Program in Review

7.2.1 Study 1

The goal of Study 1 was firstly to critically re-examine and replicate the findings of Kumar et al. (1996) who, in their study of trance-like effects, uncovered a five-factor solution of the PCI. The exploratory factor analysis employed in the current study paralleled Kumar et al.'s (1996) findings, with five factors again providing the most interpretable solution. These factors were now labelled: (1) Altered Awareness (the experience of a profound alteration in self and world); (2) Negative Affect (the experience of emotions related to anger, sadness, and fear, in addition to somatic arousal); (3) Self-Control (retention of a sense of realistic awareness and volitional control; self-awareness remains intact and memory and rationality are unaffected); (4) Positive Affect (the experience of emotions related to joy, sexual excitement, and love); and (5) Imagery (describes the amount and vividness of imagery experienced during the trance induction). Thus this initial finding provided additional support for the robust nature of the five-factor solution of trance-related experience.

The second aim of Study 1 was to test Tellegen's (1981) model of the experiential and instrumental mental sets as the state expressions of the trait of absorption. Tellegen (1981) described these two mental sets as mutually exclusive. That is, in a state of absorption (trance) brought about by a suitable induction method, high trait absorption individuals will likely experience a switch from an instrumental to experiential mental set, while low trait individuals will be more likely to retain an instrumental mental set. However, they cannot, and will not, experience both at the same time. The key finding of Study 1, however, strongly suggests that, in this respect, Tellegen's (1981) model was incorrect. The results of this study indicated that not only *could* individuals experience one or both mental sets in the same short trance period, they often *did* experience this. This was revealed via the finding that although two of the five PCI factors closely corresponded with the two mental sets, they were only modestly negatively correlated. First, the factor Altered Awareness was found to closely parallel the experiential mental set. This mental set includes strong feelings of effortlessness and non-volition that can occur when surrendering to the experience of a trance induction (Ott, 2007). The items in the Altered Awareness factor describe details related to just such changes and to profound alterations in the experience of the self. Second, the factor Self-Control closely corresponded with Tellegen's (1981) instrumental mental set. Where the experiential mental set focuses on the experience of a "deep involvement with the objects of consciousness" (Jamieson, 2005, p. 120), Tellegen (1981) claimed that it should also be defined in terms of relinquishing the instrumental set which itself involves a sense of volition, realistic awareness, and effortful cognitive control. Thus, the items in the Self-Control factor are indicative of a pattern of experience which retains the operation of the instrumental mental set.

As mentioned, the results of this study indicated that individuals could experience both altered awareness *and* a sense of self-control during the time they listened to the absorption state or trance induction. This finding, not previously anticipated, was identified in the significant but moderate negative correlation found between the two factors (r = -.22). Thus the findings indicate that the two mental sets, rather than being mutually exclusive as Tellegen (1981) claimed, can operate in the same brief time interval. This extension of Tellegen's formulation of experiential and instrumental mental sets to the description of different patterns of trance-like dissociative experiences and dissociative symptoms alike, while modifying and developing his initial account, is a principal theme emerging from this program of research.

7.2.2 Study 2

The aim of Study 2 was to investigate the role of both absorption ability and imagery ability in the phenomenology of the trance-related dissociations of experience identified in participants in Study 1. Specifically, the study examined how these traits relate to the PCI factors uncovered in Study 1. The rationale for this study, in part, came from the work of Pekala et al. (1985) who investigated whether high versus low absorption ability individuals experience different states of consciousness in response to hypnosis instruction. The aim of this study was also to extend this research by investigating the unique contributions of both the trait of absorption and the trait of imagery ability, something previously unexamined in the literature. Given that both imagery ability and absorption ability have been suggested to play a role in the experience of trance instructions (e.g., Barber, 2000), this study aimed to examine the extent to which their roles diverged in their relationship with the PCI trance factors but in particular those of Altered Awareness and Self-Control.

The results of the correlation analysis conducted in Study 2 confirmed Pekala et al.'s (1985) findings regarding absorption ability and the trance-related factors of the PCI, finding significant positive relationships with Altered Awareness, Positive Affect, and Imagery. These results also provided additional confirmation for the finding from Study 1 regarding the role of trait absorption in trance experience. Results of the multiple regression analysis revealed that the Altered Awareness factor alone was uniquely related to absorption ability.

Furthermore, the ANOVAs used to investigate individual differences in absorption ability and the experiences encountered during a trance condition supported Pekala et al.'s (1985) initial findings. Results indicated that those individuals identified as high in absorption ability experienced significantly more Positive Affect and Imagery than those medium or low in the ability, and high absorption individuals experienced more Altered Awareness than those low in the trait. Thus the provision of trance induction instructions in this study enabled high absorption individuals to engage their ability to become absorbed in self-generated imaginal episodes allowing them to experience these effects.

With respect to imagery ability, the Betts' Questionnaire Upon Mental Imagery (QMI; Sheehan, 1967) significantly correlated with Self-Control. The volitional nature of the imagery response on the Betts' QMI was interpreted as providing support for the claim in Study 1 that this

factor is closely aligned with Tellegen's (1981) instrumental mental set. Further support was garnered in the multiple regression analysis which found that Self-Control was the only factor to uniquely predict imagery ability. The Self-Control factor describes experiences related to volitional control, rationality, self-awareness, internal dialogue, and memory. These signify a reality focus during the trance state in the same way as Tellegen's (1981) instrumental mental set.

Of primary interest in this study, however, was the finding that imagery ability (as measured by Betts' QMI) did *not* correlate with the PCI factor Imagery in the trance condition. This result, although unexpected, provides integral information about the differing effects of instructions employed to elicit imagery. This finding indicates that the experience of imagery in a trance condition (PCI Imagery) and imagery ability (Betts' QMI) are due to fundamentally different processes. The Betts' QMI requires individuals to visualise the suggested images in a way that is deliberate and controlled by the parameters of the questionnaire. Individuals are not free to choose what they will envisage. The imagery instructions in the induction procedure, on the other hand, are not constraining in this way. They do not specify what individuals must imagine, but rather allows them to self-generate whatever comes to mind in response to the instructions provided. Thus the results of Study 2 determined quite definitively that the Betts' QMI and the imagery instructions contained in the trance induction are two distinct methods for eliciting imagery. The conclusion reached, therefore, is that *imagery ability* does not correspond with *imagination*.

The ANOVAs examining individual differences in imagery ability revealed that individuals high in imagery ability experienced more Self-Control than those medium or low in the trait. Notably, this was the only result found. Thus this finding also lends support to the nature of the Betts's QMI and the PCI Imagery factor (as discussed above) as it relates to high imagery ability individuals. That is, during the trance induction, individuals high in imagery ability are able, relative to those medium or low in the ability, to maintain a sense of volitional control and awareness.

Study 2 confirmed the importance of absorption ability in the (state) dissociations of experience (as defined by the five-factor PCI from Study 1) elicited by trance induction instructions. This is especially so for those individuals high in this ability. This study also provided important information about the nature of imagery ability, revealing valuable insight into the difference between imagery ability as measured by the Betts' QMI and the imagery

elicited by the instructions of the trance induction. This in turn provided important information pertinent to the principal aim of this thesis which is the examination of the role of dissociative responses in modulating affective responses to the experience of traumatic events. Principally, the five-factor PCI identified in Study 1 is a useful tool for examining the roles of absorption ability and imagery ability in an instructional condition able to elicit trance-like dissociations in ongoing experience (high Altered Awareness, or low Self-Control, or both). Ultimately, individuals high in trait absorption (relative to those medium or low in this trait) are able to experience more profound alterations in awareness, more positive feelings, and more and more vivid imagery in a trance context. Therefore, high absorption individuals are able to employ their capacity to become engaged in self-generated imagery to exclude negative thoughts or images from impinging on their awareness. This result appears to provide a fundamental pathway by which individuals may regulate their response to negative and aversive events.

7.2.3 Study 3

In Study 3, the relationship between recalled childhood exposure to abusive and/or traumatic experiences with adult measures of absorption, fantasy proneness, and imagery, as well as autonomic responses to negative affective stimuli was examined. Research has previously investigated the thorny issue of what the pathway to "imaginative involvement" (Hilgard, 1970, 1974) may involve and, as such, exposure to childhood trauma has been raised as one potential antecedent. Based on her biographical interviews with adults showing high levels of imaginative involvement, Hilgard (1970, 1974) concluded that children exposed to aversive life events such as abuse, loneliness, or extreme punishment developed proficiency for imaginative involvement as a means of coping with their negative environment. It was proposed that many of these children grew to become adults still capable of using these abilities in absorption and fantasy to escape negative life events. That is, experiences of dissociation from current reality, generated through absorption and fantasy, were habitually used as a method of self-regulating emotional arousal (see e.g., Lynn & Rhue, 1988; Nash & Lynn, 1985-1986; Nash et al., 1984; Rhue & Lynn, 1987).

Previous research found that individuals high in trait absorption are more able to effectively dissociate (detach or compartmentalise) from aversive events (e.g., Kihlstrom et al., 1994; Seligman & Kirmayer, 2008) and this may have resulted, in part, from the negative events experienced in childhood. Results obtained in Study 2 found that high absorption individuals

experienced significantly more PCI Altered Awareness (compared to medium or low absorption individuals) following a trance induction supporting the claim that individuals high in trait absorption more effectively engage this form of dissociative experience than those medium or low in the trait. These initial findings thus provided preliminary support for the paradigm of trance induction as an experimental model for state dissociation.

Study 3, therefore, extended the findings of Study 2 by examining the relationship of recalled childhood trauma on the self-regulation of a group of participants who viewed a series of negative affective images. Participants viewed these images in two conditions: a baseline condition in which images were simply viewed and then rated according to how distressing the participant judged them to be, and a trance condition in which the images were viewed and rated *following* the same standardised trance induction procedure employed in both Study 1 and Study 2. While undertaking this experiment, participants' heart rate and skin conductance responses were continuously recorded to measure (changes in the regulation of) autonomic arousal.

The results of this study revealed several instructive but sometimes surprising findings. First, an examination of the relationship between trait absorption (as measured by the MODTAS; Jamieson, 2005) and recalled childhood trauma (as measured by the four abuse subtypes of the Child Abuse and Trauma Scale [CATS; Sanders & Becker-Lausen, 1995]) found no significant association. By contrast, however, fantasy proneness (as measured by the ICMI-F; Fellows & Wright, 1989; Hough, 2006) was found to be significantly related to the recall of childhood emotional abuse and neglect (but not sexual or physical abuse) as well as to the autonomic modulation of heart rate when viewing traumatic stimuli in the trance induction condition. This result was unexpected given the abundance of research indicating that trait absorption and fantasy proneness are closely related constructs (e.g., Lynn & Rhue, 1986). However, as these results reveal, when it comes to the recall of childhood trauma, the MODTAS and the ICMI-F are not measuring the same thing, regardless of the magnitude of the relationship between them ($r = .85$ in this study).

Increasingly, researchers have addressed the issue that people high in fantasy proneness are also prone to distortions in memory (i.e., pseudomemories) and so may well report or recall events on self-report questionnaires that never actually occurred (Giesbrecht et al., 2008; Merckelbach & Muris, 2001; Näring & Nijenhuis, 2005; Pekala et al., 1999-2000). This may provide an alternative explanation for the observed links between fantasy proneness and reported

recollections of abuse in childhood. Researchers such as Merckelbach and Muris (2001) and Näring and Nijenhuis (2005) in particular, have raised the issue of whether trauma exposure leads to dissociations in experience (as a state or trait) or whether the salient (hence dissociative) abilities lead to confabulated recollections of trauma and/or dissociative symptoms (with or without exposure to major life stressors). Investigators have taken up positions on either side of this debate. Ultimately, this issue will only be resolved by collecting and assessing objective reports of whether actual childhood abuse has occurred. In the meantime, the results of the current study do not fit neatly with either position. Fantasy proneness correlated significantly with emotional abuse and neglect (and negligibly with physical and sexual abuse), while trait absorption (widely considered as a proxy for fantasy proneness) did not correlate significantly with any of the abuse subtypes.

This study also found a significant *positive* association between the Betts' QMI (Sheehan, 1967) and the neglect and physical abuse subtypes of the CATS (Sanders & Becker-Lausen, 1995). This finding contradicts any simple claim that childhood trauma results in the development of increased imagery abilities in adults as a positive association indicates high Betts' QMI scores (i.e., low imagery ability). Thus those who recalled experiences of neglect and physical abuse in childhood were poorer in their ability to form vivid images as instructed by the Betts' QMI. In addition, no significant correlations were found between the Betts' QMI and the autonomic responses (i.e., heart rate and skin conductance) evoked by viewing negative affective images.

This study also investigated the role of the recall of childhood trauma on the utilisation of affective self-regulation in adulthood by examining the relationship between the PCI factor, Self-Control (which closely corresponds to Tellegen's [1981] description of the instrumental mental set) and the CATS. It was predicted that those who recalled more childhood abuse would show weaker self-control capabilities especially during the trance induction. The results revealed that this was true but *only* for recollections of neglect and physical abuse in childhood. So the more that these types of abuses were recalled, the lower the individual's experience of conscious self-control following a trance induction. Importantly, Self-Control was also significantly negatively correlated to the Betts' QMI. That is, greater imagery ability was related to greater Self-Control in the trance condition.

Finally, this study examined the relationship between trait absorption and fantasy proneness and autonomic response regulation. Results revealed a significant negative correlation between the MODTAS and skin conductance responses in the trance condition, indicating that the greater trait absorption, the greater the rate of fall in this arousal response to the negative images presented following the trance induction. Fantasy proneness was also found to negatively correlate with skin conductance responses in the trance condition; however, it also positively correlated with overall autonomic regulation of heart rate in the trance condition. These results indicate, therefore, that high fantasy proneness played a key role in changes to the self-regulation of autonomic responses to the trauma-related stimuli presented in the trance condition. This again draws a distinction between absorption and fantasy proneness in response to this experimental model of trauma (and perhaps to trauma itself), indicating that they are not identical traits. Rather, the results highlight the fact that these abilities not only tap into different aspects of recalled abuse in childhood, they also have different relationships with adult autonomic self-regulation responses to trauma-related stimuli.

The results of this study therefore provide additional support for the claim that processes underlying the dissociative experiences observed in trance may act as a model of trauma-related dissociation. In this study, individuals high in absorption and fantasy proneness showed greater self-regulation of their autonomic responses in the trance condition when confronted with strong negative affective images. This was not evident in the baseline condition. Thus the conclusion reached in this study is that for those with the requisite abilities, trance instructions evoke dissociative changes in experience which provide a pathway for the modulation of intense negative affect (a core component of real-life trauma) and this seems to be especially so for individuals who recall particular types of childhood abuse.

7.2.4 Study 4

In the final study, two samples of participants, one comprised largely of university students (i.e., general population sample) and the other constituted of individuals whose occupations could best be described as emergency service workers (i.e., occupational trauma exposed), viewed a series of negative affective images in the same two conditions as Study 3 (i.e., baseline and trance induction). The aim of this study was to examine the impact of adult exposure to traumatic events on the use of dissociative processes in the self-regulation of the emotional responses evoked. This study extended the methodology of Study 3 by comparing the two groups' autonomic responses

(i.e., skin conductance and heart rate variability [HRV]) and subjective ratings of distress when viewing negative images in addition to examining the brain's electrophysiological response engaged in processing such images. The results of this study demonstrated the importance of considering the regulation of *each* of the above aspects of emotional response (autonomic nervous system, central nervous system, and subjective experience) rather than treating any as a simple proxy of another as each demonstrated distinct aspects of the self-regulation of the emotional response to these stimuli as indicated below.

Research has revealed that individuals employed in occupations which include working repeatedly with victims of trauma (e.g., police, ambulance officers, military officers, etc.) as part of their purview are likely to experience psychological outcomes similar to the victims themselves. This research, which has grown into an area of scholarship focused on the concept of vicarious (or indirect) traumatisation (e.g., Bell et al., 2003; Clark & Gioro, 1998; Figley, 1983; McCann & Pearlman, 1990), found that because these occupations tend to be unpredictable in their day-to-day operation and involve close engagement with trauma victims, the employees themselves are liable to experience similar outcomes to that of the victims. Thus these individuals are a readily identifiable and accessible group of participants for any experimental research in the area of trauma exposure. Utilising this rationale, the current study recruited members of various emergency service organisations and contrasted their responses to a series of negative images against a general population sample comprised of individuals without such employment-related experiences.

Only the central findings are discussed in detail here. Results of the first correlation analysis revealed that the change score employed to measure the difference between subjective intensity ratings of the images in the baseline and trance conditions was positively associated with the CATS (Sanders & Becker-Lausen, 1995) subtypes of sexual abuse and emotional abuse. This result indicated the difference between the mean score allocated to the images in the baseline condition compared to the mean score allocated in the trance condition (i.e., the reduction in subjective distress in the trance condition) was associated with the recall of these types of abuse. Interestingly, the change score showed no association with either neglect or physical abuse, raising the possibility that distinctive self-regulatory processes (e.g., experiential and instrumental mental sets) may be related to different types of recalled (and perhaps actual) childhood abuse. A current influential theory ties the sequelae of child sexual abuse and physical abuse (not observed

here) based on shared threat to the physical integrity of the individual and the supposed greater intensity of these forms of abuse (Nijenhuis et al., 2010). In Studies 3 and 4, by contrast, neglect and physical abuse appear to be more closely related to disruptions in the operation of the experiential set. Although requiring much further investigation, it is tentatively proposed here that physical abuse and neglect pose a primary threat to the physical integrity of the organism and will strongly trigger related defensive mechanisms, while emotional and sexual abuse pose a primary threat to the attachment bond and will trigger a different set of inter- (and intra-) personal affective defences (DePrince & Freyd, 2004).

The change score of the average ratings of affective intensity was also found to positively correlate with both fantasy proneness and the PCI factor Altered Awareness, indicating that both this form of dissociative experience during the trance induction as well as a history of imaginative involvement across childhood and adulthood are involved in the decrease in the intensity of the negative affective response experienced in the trance condition compared to the baseline condition. It appears that trance induction provides an important pathway to mitigate intense subjective distress. This result again provides additional support for the contention raised in Study 3 that trance induction provides a plausible experimental model for that form of dissociative experience labelled as detachment by Holmes et al. (2005) and emotional numbing by Bryant (2005).

A series of mixed model ANOVAs was then employed to examine whether the two groups differed in their responses to the images between the baseline and trance induction conditions. For the average intensity ratings, no significant change between the two conditions was found for the trauma exposed sample; however, the general population's average ratings were significantly lower in the trance condition compared to the baseline condition. This finding demonstrated the effect of trance induction in modulating negative affect when viewing aversive images. This finding strengthens the argument that the trance condition elicits a state of dissociation from the experience of negative affect.

By contrast, the intensity ratings for the occupational trauma exposure sample were highly stable between the two conditions. It may be that this group, because of their previous exposure to traumatic events, was in all likelihood relying on strategies unrelated to trance in order to cope with their negative affect. Alternatively, it may be that this group show a floor effect in their utilisation of a trance-related mechanism that they have learned to employ whenever confronted

by such scenes (see below). The importance of developing adaptive coping skills in their workers has been of utmost importance for many organisations. For example, the Ambulance Service of New South Wales (n.d.) has been vigilant in their support of education for their staff, raising awareness of the effects exposure to traumatic events can have on individual wellbeing. Other emergency response organisations have much to learn from this example.

The final analyses in this study investigated the neural networks underlying the differences in affective response (low = 1 and 2; high = 3 and 4) in trance and baseline conditions, in the general population and trauma exposed samples, in response to the negative affective images presented. This end was achieved via the Partial Least Squares (PLS; McIntosh & Lobaugh, 2004) analysis technique. The application of PLS is a recent innovation in the analysis of the relationship between experimental conditions and the elements of multivariate neuroscience data sets (such as EEG or functional magnetic resonance imaging). Permutation tests showed two significant latent variables (LVs).

LV1 was found to correspond to a neural network, responding to high intensity negative stimuli, which modulated the experience of negative affect in the occupational trauma exposed sample. This LV was particularly sensitive to the transition between the baseline high and trance high conditions and an association was found between this contrast and lower average intensity ratings by the trauma exposed group in both conditions. Although the ANOVA did not reveal any difference in rating intensity between the two conditions for the trauma exposed sample, the underlying neural processes regulating affective intensity in this group were directly related to the experience of dissociation in the trance condition including (detachment-like) PCI Altered Awareness.

LV2 displayed a similar pattern of design scores (indicating salient contrasts of experimental conditions) for both the general population and trauma exposed samples. The primary contrast was found to be between the trance high and baseline low conditions with the trauma exposed sample presenting a larger magnitude of effects compared to the general population sample. LV2 was characterised in terms of the principal finding that the transition between the baseline low and trance high conditions was significantly positively associated with the PCI trance factor Altered Awareness (r = .71) and significantly negatively related to Self-Control (r = -.78). These two PCI trance factors have been argued to correspond closely to the two components of

dissociative symptoms labelled, respectively, detachment and compartmentalisation by Holmes et al. (2005) and to the experiential and instrumental mental sets as described by Tellegen (1981).

The occupational trauma exposed sample also showed a strong association between the change in the functional operation of the neural network LV2 in the transition from the baseline low to trance low conditions with the low frequency component of HRV (r = .72). This result indicated that the larger the shift in LV2 from the baseline low to trance low, the greater the sympathetic modulation of heart rate in the trance condition.

In summary, the results of the PLS analysis revealed a significant role for trance induction and associated dissociations in experience in reducing or modulating the experience of negative affect in response to aversive images. These processes were directly related to the self-regulation of subjective and autonomic components of the emotional responses of the occupational trauma exposed sample in both baseline and trance conditions. The PLS identified two central nervous system processes regulating, respectively, the subjective and autonomic components of affective response to the experimental trauma paradigm. Both processes were most evident in the sample with occupational experience in trauma-related fields. Results suggest that those in this group have learned to utilise these mechanisms (amongst others) to alleviate negative affect induced by trauma exposure. The habitual use of such mechanisms thus appears to be linked with previous exposure to traumatic events.

The next step for research is to identify the specific anatomical components of the neural networks which underpin the experiential and instrumental mental sets, the PCI factors of Altered Awareness and Self-Control, as identified in the current program of research. Once this is established, the direct study of the psychological function of these two distinct neural networks of self-regulation can be undertaken. Questions that must be addressed in such a program of research will include: What are the temporal dynamics of these two mental sets? What is their developmental history? And how do they relate to each other and to other recently discovered neural networks? Addressing these questions will provide us with the information necessary to determine how they operate and function in both pathological and nonpathological experiences of dissociation and the pathways by which they may intersect with the human experience of trauma.

7.3 Implications

The program of research contained within this thesis clearly indicates that the two core features of the phenomenology of dissociative symptoms (e.g., Holmes et al., 2005) closely parallels two core features found in the phenomenology of absorption and/or trance states. Trance-like dissociation is an experience involving two related but distinct facets, on the one hand, an alteration in awareness, body image, perception, time, meaning, and attention, and on the other alteration in self-awareness, memory, volitional control, rationality, and internal dialogue. As argued across Studies 1, 2, and 3, the first group of experiences correspond to Tellegen's (1981) definition of an experiential mental set, with its emphasis on being receptive or open to whatever experiential transformations may unfold, and the latter group to his instrumental mental set defined as a form of experience oriented towards action, volition, and goal-directed behaviour. However, as distinct from Tellegen's account, in which the operation of the two mental sets are considered to be mutually exclusive, Study 1 found that while diverse in their focus, the two sets are not unrelated and may in fact occur in tandem in the same brief timeframe following a trance induction. Thus these two dimensions of trance were found to be central to the state expressions of trait absorption. This thesis presented evidence that state dissociation is a multifaceted experience, with component processes closely resembling Tellegen's experiential and instrumental mental sets. Unlike Tellegen's account, however, the operation of processes related to the instrumental set are not mutually exclusive with the operation of processes related to the experiential set (although they do tend to be negatively correlated).

The second major finding revealed in this thesis is that individuals who have prior exposure to traumatic events, be they recollections of mistreatment occurring in childhood or as a result of occupational exposure in adulthood, modulate their experience of negative affect when presented with images displaying intensely distressing scenes with processes directly related to the features of dissociative experience (i.e., detaching and compartmentalising) in the trance induction condition. With respect to those with occupational trauma exposure, these individuals differ significantly in the central nervous system mechanisms utilised to regulate emotional responding, from a comparison group comprised of members of the general public and who are unlikely to have been confronted by such trauma on a potentially day-to-day basis. The distress experienced by the general population sample, however, appeared to be modulated by their response to the

induction designed to place individuals in a trance-like absorption state (Jamieson, 2007). This was seen in Study 4 whereby these individuals rated their experience of affective distress as lower in the trance condition relative to the baseline condition. This finding underscores the clinical significance of utilising trance induction instructions (without further suggestion) as a method of assisting individuals to affectively disengage from otherwise overwhelming events they may experience in their life. These results support the use of trance instruction as a valuable technique which can be employed by clinicians to assist their clients to adaptively cope with the effects of "overwhelming negative affect" (Brown, 2004).

Additionally, these findings illustrate the value of examining individuals with occupational trauma exposure in addition to the immediate victims of the trauma who members of the occupational group are themselves called upon to assist. The results clearly indicate that sustained trauma exposure in adults is linked to the development of successful somatic self-regulation responses. The implication of this result is that organisations such as the police, ambulance, and fire services, as well as health care providers (e.g., psychologists, nurses, doctors, etc.), among others, would better train their new recruits by incorporating ongoing graded exposure to the particular stressors inherent in their particular field of service along with direct education and practise in the psychological management (including the use of self-induced trance-like states) of their own traumatic stress responses.

7.4 Future Directions: The Clinical Implications of Dissociative Coping

One of the chief findings of clinical relevance from the current program of research was that adults with ongoing exposure to traumatic events develop the capacity to modulate their emotional arousal when viewing traumatic scenes more effectively than those without such experience. Those who did not have such ongoing experience were instead able to utilise a trance instruction in order to modulate their experience of negative affect (see Study 4). While this inherent self-regulatory ability appears on the surface to be an adaptive mechanism, allowing trauma exposed individuals to better cope with the stresses associated with their work, an investigation into their overall wellbeing was not conducted. How these individuals with long-term trauma exposure function in their everyday lives was not examined in any detail. While participants were administered the Kessler Psychological Distress Scale (K10; Kessler et al., 2002) as a measure of the experience of anxiety or depressive symptomatology in the previous four week period, no other measures examining life/work satisfaction or quality of life in general

were utilised. While the K10 revealed that the majority of participants were at no risk of developing anxiety or depression, this does not mean that individuals were not dissatisfied with life, or at risk from other maladaptive coping strategies such as avoidance or denial. As discussed in Chapter 2, while dissociation can be beneficial and adaptive in the short term by limiting the distress and negative affect experienced as a result of the traumatic event, the long-term use of dissociative processes can become maladaptive if they do not allow for the incorporation of the aversiveness of the event into conscious awareness (Nixon et al., 2005). The examination of whether the use of dissociative abilities was psychologically adaptive or maladaptive for the individuals tested outside the immediate experimental context was not undertaken in the present research. A more comprehensive evaluation of individual wellbeing and everyday functioning, therefore, would be useful in order to assess whether the efficacy of dissociative capacities in regulating trauma-related affect may also contribute to some later forms of psychological dysfunction. While examining whether individuals with occupational trauma exposure are more or less capable than those without such exposure to regulate their emotional responses when viewing distressing images, we have barely scratched the surface of what these people are experiencing in their everyday lives.

A further set of research questions also emerges related to the impact of the timing of repeated exposure on the development of dissociative capacities for affective self-regulation. For people entering such professions, how much trauma exposure does it take to develop mechanisms of self-regulation? Is this process rapid or gradual? Does it "wear off" after time since last exposure and, if so, how rapidly?

Although not formally necessary to test the hypotheses examined in the course of this thesis, the inclusion of an additional eyes closed resting condition to establish a baseline PCI reference interval, prior to the trance induction procedure would have provided a useful addition to each of studies in the present program of research. While not directly stated by Tellegen (1981), that account may be extended to imply that an absorption state or trance induction should result in a shift in the phenomenology of consciousness dominated by the experiential mental set prior to the induction and an instrumental set during or immediately following the induction. Therefore it would be most informative to be able to compare the PCI trance induction measures examined in each of the four studies here to the equivalent measure taken in the immediate pre-induction

period (or in the case of exposure to negative affective stimuli, prior to the viewing of these stimuli in the baseline condition as well as the trance condition).

Another area of investigation which is vital for a better understanding of the clinical implications of dissociative coping is a longitudinal examination of children and/or adolescents, a population not recruited in the current research. While there has been research investigating the experience of childhood trauma (such as mistreatment by caregivers) as a developmental pathway to dissociation in certain child populations (e.g., Dutra, Bureau, Holmes, Lyubchik, & Lyons-Ruth, 2009; Hulette, Freyd, & Fisher, 2011), further research needs to be conducted with respect to whether the channels proposed by Hilgard (1970, 1974) and Lynn and Rhue (1988) relating to *both* the positive (e.g., being encouraged to do so by a caregiver) and negative (i.e., escaping a traumatic environment) aspects of utilising dissociative mechanisms are truly the means by which dissociative tendencies develop. Much of the research conducted on the antecedents of various traits such as fantasy proneness, for instance, have involved retrospective self-reports for events that occurred in childhood. In most instances, the objective accuracy of such memories cannot be determined (Giesbrecht et al., 2008). A more effective strategy would be to conduct longitudinal studies following children across the course of their childhood. Prospective studies are required to test the hypothesis that individuals who show higher state dissociation scores in trance-like contexts are more likely to develop dissociative symptoms when exposed to traumatic life events (e.g., Kihlstrom, 2005). A separate set of prospective studies are required to test the alternative (but not necessarily mutually exclusive) hypothesis that exposure to trauma, particularly in childhood, fosters the development of the dissociative capacities observed in the experiences of individuals in trance-like contexts. Investigating this claim would ultimately involve an intense long-term focus in which children would need to be examined over many years in order to test the theoretical hypotheses proposed by researchers. The developmental antecedents and consequences of the capacity for dissociative experience must be empirically established before the full clinical relevance, for better or worse, of dissociative processes can be evaluated.

References

Abdi, H. (2003). Factor rotations in factor analyses. In M. Lewis-Beck, A. Bryman & T. Futing (Eds.), *Encyclopedia of social sciences research methods* (pp. 1-8). Thousand Oaks, CA: Sage.

Allport, G. W. (1956). *Personality: A psychological interpretation*. London: Constable & Company.

Ambulance Service of New South Wales. (n.d.). Coping with trauma for ambulance staff. Retrieved from http://www.ambulance.nsw.gov.au/Media/docs/Trauma_Support_for_Staff-355969d6-e275-4dca-a755-f1b164858c6e-0.pdf

American Psychiatric Association (1987). *Diagnostic and statistical manual of mental disorders: Revision* (3rd ed.). Arlington, VA: American Psychiatric Association.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders: Text revision* (4th ed.). Arlington, VA: American Psychiatric Association.

Amrhein, C., Mühlberger, A., Pauli, P., & Wiedemann, G. (2004). Modulation of event-related potentials during affective picture processing: A complement to startle reflex and skin conductance response? *International Journal of Psychophysiology, 54*(3), 231-240.

Andreassi, J. L. (2007). *Psychophysiology: Human behavior and physiological response* (5th ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Andrews, G. & Slade, T. (2001). Interpreting scores on the Kessler Psychological Distress Scale (K10). *Australian and New Zealand Journal of Public Health, 25*(6), 494-497.

Appelhans, B. M. & Luecken, L. J. (2006). Heart rate variability as an index of regulated emotional responding. *Review of General Psychology, 10*(3), 229-240.

Ås, A. (1962). Non-hypnotic experiences related to hypnotizability in male and female college students. *Scandinavian Journal of Psychology, 3*(1), 112-121.

Ås, A. & Lauer, L. W. (1962). A factor-analytic study of hypnotizability and related personal experiences [Abstract]. *International Journal of Clinical and Experimental Hypnosis, 10*(3), 169-181.

Ås, A., O'Hara, J. W., & Munger, M. P. (1962). The measurement of subjective experiences presumably related to hypnotic susceptibility [Abstract]. *Scandinavian Journal of Psychology, 3*(1), 47-64.

Australian Bureau of Statistics. (2006). 2006 census of population and housing Australia (Australia) occupation (a) by sex count of employed persons aged 15 years and over based on place of employment, table, Cat. no. 2068.0 Retrieved from http://www.censusdata.abs.gov.au

Australian Bureau of Statistics. (2009). Sub-major group 44 protective service workers Retrieved from http://www.abs.gov.au/AUSSTATS/abs@.nsf/0/AA349B9E33DFF083CA2575DF002DA615?opendocument

Barber, T. X. (2000). A deeper understanding of hypnosis: Its secrets, its nature, its essence. *American Journal of Clinical Hypnosis, 42*(3/4), 208-272.

Barnier, A. J., Cox, R. E., O'Connor, A., Coltheart, M., Langdon, R., Breen, N., et al. (2008). Developing hypnotic analogues of clinical delusions: Mirrored-self misidentification. *Cognitive Neuropsychiatry, 13*(5), 406-430.

Barnier, A. J. & McConkey, K. M. (1999). Absorption, hypnotizability and context: Non-hypnotic contexts are not all the same. *Contemporary Hypnosis, 16*(1), 1-8.

Bayne, T. (2007a). Hypnosis and the unity of consciousness. In G. A. Jamieson (Ed.), *Hypnosis and conscious states: The cognitive neuroscience perspective* (pp. 93-109). Oxford: Oxford University Press.

Bayne, T. (2007b). Conscious states and conscious creatures: Explanation in the scientific study of consciousness. *Philosophical Perspectives, 21*(1), 1-22.

Beaton, R., Murphy, S., Johnson, C., Pike, K., & Corneil, W. (1999). Coping responses and posttraumatic stress symptomatology in urban fire service personnel. *Journal of Traumatic Stress, 12*(2), 293-308.

Bell, H., Kulkarni, S., & Dalton, L. (2003). Organizational prevention of vicarious trauma. *Families in Society: The Journal of Contemporary Human Services, 84*(4), 463-470.

Berman, R. A. & Wurtz, R. H. (2008). Exploring the pulvinar path to visual cortex. *Progress in Brain Research, 171*, 467-473.

Bernstein, D. P., Fink, L., Handelsman, L., Foote, J., Lovejoy, M., Wenzel, K., et al. (1994). Initial reliability and validity of a new retrospective measure of child abuse and neglect [Abstract]. *American Journal of Psychiatry, 151*(8), 1132-1136.

Bernstein, E. M. & Putnam, F. W. (1986). Development, reliability, and validity of a dissociation scale [Abstract]. *Journal of Nervous & Mental Disease, 174*(12), 727-735.

Betts, G. H. (1909). *The distribution and functions of mental imagery*. New York: Teachers College, Columbia University.

BIOPAC Systems Inc. (2001). Acq*Knowledge* (3.7.4) [Computer Software]. Santa Barbara, CA: BIOPAC Systems Inc.

Bradley, M. M., Cuthbert, B. N., & Lang, P. J. (1996). Picture media and emotion: Effects of a sustained affective context. *Psychophysiology, 33*(6), 662-670.

Braffman, W. & Kirsch, I. (1999). Imaginative suggestibility and hypnotizability: An empirical analysis. *Journal of Personality and Social Psychology, 77*(3), 578-587.

Bremner, J. D., Vermetten, E., & Mazure, C. M. (2000). Development and preliminary psychometric properties of an instrument for the measurement of childhood trauma: The early trauma inventory. *Depression and Anxiety, 12*(1), 1-12.

Brewin, C. R., Andrews, B., & Gotlib, I. H. (1993). Psychopathology and early experience: A reappraisal of retrospective reports. *Psychological Bulletin, 113*(1), 82-98.

Briere, J. & Runtz, M. (1988). Multivariate correlates of childhood psychological and physical maltreatment among university women. *Child Abuse & Neglect, 12*(3), 331-341.

Brown, R.J. (2002). The cognitive psychology of dissociative states. *Cognitive Neuropsychiatry, 7*(3), 221-235.

Brown, R.J. (2004). Psychological mechanisms of medically unexplained symptoms: An integrative conceptual model. *Psychological Bulletin, 130*(5), 793-812.

Bryant, R. A. (2005). Hypnotic emotional numbing: A study of implicit emotion. *International Journal of Clinical and Experimental Hypnosis, 53*(1), 26-36.

Bryant, R. A. & Harvey, A. G. (2003). Gender differences in the relationship between acute stress disorder and posttraumatic stress disorder following motor vehicle accidents. *Australian and New Zealand Journal of Psychiatry, 37*(2), 226-229.

Bryant, R. A., Harvey, A. G., Guthrie, R. M., & Moulds, M. L. (2000). A prospective study of psychophysiological arousal, acute stress disorder, and posttraumatic stress disorder. *Journal of Abnormal Psychology, 109*(2), 341-344.

Bryant, R. A. & Kapur, A. (2006). Hypnotically induced emotional numbing: The roles of hypnosis and hypnotizability. *International Journal of Clinical and Experimental Hypnosis, 54*(3), 281-291.

Bryant, R. A. & Kourch, M. (2001). Hypnotically induced emotional numbing. *International Journal of Clinical and Experimental Hypnosis, 49*(3), 220-230.

Bryant, R. A. & Mallard, D. (2002). Hypnotically induced emotional numbing: A real-simulating analysis. *Journal of Abnormal Psychology, 111*(1), 203-207.

Bush, G., Luu, P., & Posner, M. I. (2000). Cognitive and emotional influences in anterior cingulate cortex. *Trends in Cognitive Sciences, 4*(6), 215-222.

Butler, L. D. (2006). Normative dissociation. *The Psychiatric Clinics of North America, 29*(1), 45-62.

Butler, L. D., Duran, R. E. F., Jasiukaitis, P., Koopman, C., & Spiegel, D. (1996). Hypnotizability and traumatic experience: A diathesis-stress model of dissociative symptomatology. *The American Journal of Psychiatry, 153*(7), 42-63.

Canli, T., Zhao, Z., Brewer, J., Gabrieli, J. D. E., & Cahill, L. (2000). Event-related activation in the human amygdala associates with later memory for individual emotional experience. *Journal of Neuroscience, 20*(RC99). Retrieved from http://www.jneurosci.org/cgi/reprint/20004570v1

Cardeña, E. (1994). The domain of dissociation. In S. J. Lynn & J. W. Rhue (Eds.), *Dissociation: Clinical and theoretical perspectives* (pp. 15-31). New York: The Guildford Press.

Cardeña, E. & Spiegel, D. (1993). Dissociative reactions to the San Francisco Bay Area earthquake of 1989. *The American Journal of Psychiatry, 150*(3), 474-478.

Carlson, E. A., Yates, T. M., & Sroufe, L. A. (2009). Development of dissociation and development of the self. In P. F. Dell & J. O'Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 39-52). New York: Routledge.

Carlson, N. R. (2002). *Foundations of physiological psychology* (5th ed.). Boston: Allyn & Bacon.

Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research, 1*(2), 245-276.

Chaplin, W. F., John, O. P., & Goldberg, L. R. (1988). Conceptions of states and traits: Dimensional attributes with ideals as prototypes. *Journal of Personality and Social Psychology, 54*(4), 541-557.

Clark, M. L. & Gioro, S. (1998). Nurses, indirect trauma, and prevention. *Image: Journal of Nursing Scholarship, 30*(1), 85-87.

Classen, C., Koopman, C., & Spiegel, D. (1993). Trauma and dissociation. *Bulletin of the Menniger Clinic, 57*(2), 178-194.

Clinical Research Unit for Anxiety and Depression. (2003). K10 symptom scale. Retrieved from http://www.crufad.unsw.edu.au/K10/k10info.htm

Codispoti, M., Bradley, M. M., & Lang, P. J. (2001). Affective reactions to briefly presented pictures. *Psychophysiology, 38*(3), 474-478.

Codispoti, M., Ferrari, V., & Bradley, M. M. (2006). Repetitive picture processing: Autonomic and cortical correlates. *Brain Research, 1068*(1), 213-220.

Codispoti, M., Ferrari, V., & Bradley, M. M. (2007). Repetition and event-related potentials: Distinguishing early and late processes in affective picture perception. *Journal of Cognitive Neuroscience, 19*(4), 577-586.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New Jersey: Lawrence Erlbaum.

Cohen, R. A., Grieve, S., Hoth, K. F., Paul, R. H., Sweet, L., Tate, D., et al. (2006). Early life stress and morphometry of the adult anterior cingulate cortex and caudate nuclei. *Biological Psychiatry, 59*(10), 975-982.

Comeau, A. C. S., Yeh, W. H., Abizaid, A., Hellemans, K. G., & D'Angiulli, A. (2010, May). *Chopped arms and big macs: ERP correlates of viewing and imagining aversive and food photos*: Poster presented at the 2010 Canadian Neuroscience Meeting, Ottawa, Ontario.

Compumedics Neuroscan. (2003). STIM^2 [Computer Software]. Charlotte, NC: Compumedics Neuroscan.

Croft, R. J. & Barry, R. J. (2000). Removal of ocular artifact from the EEG: A review. *Clinical Neurophysiology, 30*(1), 5-19.

Cuthbert, B. N., Schupp, H. T., Bradley, M. M., Birbaumer, N., & Lang, P. J. (2000). Brain potentials in affective picture processing: Covariation with automatic arousal and affective report. *Biological Psychology, 52*(2), 95-111.

Darlington, R. B. (n.d.). *Factor analysis.* Retrieved from http://www.psych.cornell.edu/darlington/factor.htm

De Pascalis, V. (1999). Psychophysiological correlates of hypnosis and hypnotic susceptibility. *International Journal of Clinical and Experimental Hypnosis, 47*(2), 117-143.

de Vaus, D. (2009). *Analyzing social science data: 50 key problems in data analysis*. Los Angeles: Sage.

Dennis, T. A. & Hajcak, G. (2009). The late positive potential: A neurophysiological marker for emotion regulation in children. *Journal of Child Psychology and Psychiatry, 50*(11), 1373-1383.

DePrince, A. P. & Freyd, J. J. (2004). Forgetting trauma stimuli. *Psychological Science, 15*(7), 488-492.

Derryberry, D. & Tucker, D. M. (1992). Neural mechanisms of emotion. *Journal of Consulting and Clinical Psychology, 60*(3), 329-338.

Devinsky, O., Morrell, M. J., & Vogt, B. A. (1995). Contributions of anterior cingulate cortex to behaviour. *Brain, 118*(1), 279-306.

Diamond, S. G., Davis, O. C., & Howe, R. D. (2008). Heart rate variability as a quantitative measure of hypnotic depth. *International Journal of Clinical and Experimental Hypnosis, 56*(1), 1-18.

Dutra, L., Bureau, J.-F., Holmes, B., Lyubchik, A., & Lyons-Ruth, K. (2009). Quality of early care and childhood trauma: A prospective study of developmental pathways to dissociation. *Journal of Nervous & Mental Disease, 197*(6), 383-390.

Düzel, E., Habib, R., Schott, B., Schoenfeld, A., Lobaugh, N. L., McIntosh, A. R., et al. (2003). A multivariate, spatiotemporal analysis of electromagnetic time-frequency data of recognition memory. *NeuroImage, 18*(2), 185-197.

Efron, B. & Tibshirani, R. (1986). Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. *Statistical Science, 1*(1), 54-77.

Egner, T., Jamieson, G. A., & Gruzelier, J. (2005). Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe. *NeuroImage, 27*(4), 969-978.

Eisenberger, N. I. & Lieberman, M. D. (2004). Why rejection hurts: A common neural alarm system for physical and social pain. *Trends in Cognitive Sciences, 8*(7), 294-300.

Etkin, A., Egner, T., & Kalisch, R. (2011). Emotional processing in anterior cingulate and medial prefrontal cortex. *Trends in Cognitive Sciences, 15*(2), 85-93.

Etkin, A., Egner, T., Peraza, D. M., Kandel, E. R., & Hirsch, J. (2006). Resolving emotional conflict: A role for the rostral anterior cingulate cortex in modulating activity in the amygdala. *Neuron, 51*(6), 871-882.

Fassler, O., Knox, J., & Lynn, S. J. (2006). The Iowa sleep experiences survey: Hypnotizability, absorption, and dissociation. *Personality and Individual Differences, 41*(4), 675-684.

Faymonville, M. E., Laureys, S., Degueldre, C., Del Fiore, G., Luxen, A., Franck, G., et al. (2000). Neural mechanisms of antinociceptive effects of hypnosis. *Anesthesiology, 92*(5), 1257-1267.

Faymonville, M. E., Roediger, L., Del Fiore, G., Degueldre, C., Phillips, C., Lamy, M., et al. (2003). Increased cerebral functional connectivity underlying the antinociceptive effects of hypnosis *Cognitive Brain Research, 17*(2), 255-262.

Fearnley, S. J. (1995). Pulse oximetry. *Update in Anaesthesia, 5*. Retrieved from http://www.nda.ox.ac.uk/wfsa/html/u05/u05_003.htm

Feinauer, L. L. (1989). Comparison of long-term effects of child abuse by type of abuse and by relationship of the offender to the victim (Abstract). *American Journal of Family Therapy, 17*(1), 48-56.

Fellows, B. J. & Wright, V. (1989). Fantasy proneness: Data and observations on the British use of the Inventory of Childhood Memories and Imaginings (ICMI). *British Journal of Experimental and Clinical Hypnosis, 6*(1), 57-59.

Figley, C. R. (1983). Catastrophes: An overview of family reaction. In C. R. Figley & H. I. McCubbin (Eds.), *Stress and the family: Coping with catastrophe* (Vol. 2, pp. 3-20). New York: Brunner/Mazel.

Figley, C. R. (Ed.). (1995). *Compassion fatigue: Coping with secondary traumatic stress disorder in those who treat the traumatized*. Levittown, PA: Brunner/Mazel.

Foa, E. B. & Riggs, D. S. (1995). Posttraumatic stress disorder following assault: Theoretical considerations and empirical findings. *Current Directions in Psychological Science, 4*(2), 61-65.

Foa, E. B., Zinbarg, R., & Rothbaum, B. O. (1992). Uncontrollability and unpredictability in post-traumatic stress disorder: An animal model. *Psychological Bulletin, 112*(2), 218-238.

Forbes, E. J. & Pekala, R. J. (1996). Types of hypnotically (un)susceptible individuals as a function of phenomenological experience: A partial replication. *Australian Journal of Clinical and Experimental Hypnosis, 24*, 92-109.

Freyd, J. J. (1994). Betrayal trauma: Traumatic amnesia as an adaptive response to childhood abuse. *Ethics & Behavior, 4*(4), 307-329.

Freyd, J. J. (1996). *Betrayal trauma: The logic of forgetting childhood abuse*. Cambridge, MA: Harvard University Press.

Garavan, H., Pendergrass, J. C., Ross, T. J., Stein, E. A., & Risinger, R. C. (2001). Amygdala response to both positively and negatively valenced stimuli. *NeuroReport, 12*(12), 2779-2783.

Gardner, R. C. & Neufeld, R. W. J. (1987). Use of the simple change score in correlational analyses. *Educational and Psychological Measurement, 47*(4), 849-864.

Gaudiano, B. (2000). TFT and heart rate variability claims demystified. Retrieved from http://www.geocities.com/pseudoscience_2000/hrv.htm

Gavazzeni, J., Wiens, S., & Fischer, H. (2008). Age effects to negative arousal differ for self-report and electrodermal activity. *Psychophysiology, 45*(1), 148-151.

Gemignani, A., Santarcangelo, E. L., Sebastiani, L., Marchese, C., Mammoliti, R., Simoni, A., et al. (2000). Changes in autonomic and EEG patterns induced by hypnotic imagination of aversive stimuli in man. *Brain Research Bulletin, 53*(1), 105-111.

Genest, M., Levine, J., Ramsden, V., & Swanson, R. (1990). The impact of providing help: Emergency workers and cardiopulmonary resuscitation attempts. *Journal of Traumatic Stress, 3*(2), 305-313.

Geraerts, E., Merckelbach, H., Jelicic, M., Smeets, E., & Van Heerden, J. (2006). Dissociative symptoms and how they relate to fantasy proneness in women reporting repressed or recovered memories. *Personality and Individual Differences, 40*(6), 1143-1151.

Giesbrecht, T., Lynn, S.J., Lilienfeld, S.O., & Merckelbach, H. (2008). Cognitive processes in dissociation: An analysis of core theoretical assumptions. *Psychological Bulletin, 134*(5), 617-647.

Glaser, D. (2000). Child abuse and neglect and the brain - A review. *Journal of Child Psychology and Psychiatry, 41*(1), 97-116.

Good, P. (2000). *Permutation tests: A practical guide to resampling methods for testing hypotheses* (2nd ed.). New York: Springer.

Gordon, R. (1949). An investigation into some of the factors that favour the formation of stereotyped images. *British Journal of Psychology, 39*(3), 156-167.

Griffin, M. G., Resick, P. A., & Mechanic, M. B. (1997). Objective assessment of peritraumatic dissociation: Psychophysiological indicators. *American Journal of Psychiatry, 154*(8), 1081-1088.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Hamann, S. B., Ely, T. D., Hoffman, J. M., & Kilts, C. D. (2002). Ecstasy and agony: Activation of the human amygdala in positive and negative emotion. *Psychological Science, 13*(2), 135-141.

Hart, S. N. & Brassard, M. R. (1987). A major threat to children's mental health: Psychological maltreatment. *American Psychologist, 42*(2), 160-165.

Harvey, A. G. & Bryant, R. A. (1999). Predictors of acute stress following motor vehicle accidents. *Journal of Traumatic Stress, 12*(3), 519-525.

Herman, J. L. (1997). *Trauma and recovery: The aftermath of violence - from domestic abuse to political terror*. New York: BasicBooks.

Hides, L., Lubman, D. I., Devlin, H., Cotton, S., Aitken, C., Gibbie, T., et al. (2007). Reliability and validity of the Kessler 10 and Patient Health Questionnaire among injecting drug users. *Australian and New Zealand Journal of Psychiatry, 41*(2), 166-168.

Hilgard, E. R. (1969). Altered states of awareness. *Journal of Nervous & Mental Disease, 149*(1), 68-79.

Hilgard, J. R. (1970). *Personality and hypnosis: A study of imaginative involvement*. Chicago: The University of Chicago Press.

Hilgard, J. R. (1974). Imaginative involvement: Some characteristics of the highly hypnotizable and the non-hypnotizable. *International Journal of Clinical and Experimental Hypnosis, 22*(2), 138-156.

Holmes, E. A., Brown, R. J., Mansell, W., Fearon, R. P., Hunter, E. C. M., Frasquilho, F., et al. (2005). Are there two qualitatively distinct forms of dissociation? A review and some clinical implications. *Clinical Psychology Review, 25*(1), 1-23.

Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika, 30*(2), 179-185.

Hough, M. J. (2006). *Fantasy-absorption: A little known personality trait predicting health change* (Unpublished doctoral dissertation). University of Sydney, New South Wales, Australia.

Hugdahl, K. (2001). *Psychophysiology: The mind-body perspective*. Cambridge, MA: Harvard University Press.

Hulette, A. C., Freyd, J. J., & Fisher, P. A. (2011). Dissociation in middle childhood among foster children with early maltreatment experiences. *Child Abuse & Neglect, 35*(2), 123-126.

Hutchinson-Phillips, S., Gow, K., & Jamieson, G. A. (2007). Hypnotizability, eating behaviors, attitudes, and concerns: A literature survey. *International Journal of Clinical and Experimental Hypnosis, 55*(1), 84-113.

Hutchinson-Phillips, S., Jamieson, G. A., & Gow, K. (2005). Differing roles of imagination and hypnosis in self-regulation of eating behaviour. *Contemporary Hypnosis, 22*(4), 171-183.

Jambrik, Z., Sebastiani, L., Picano, E., Ghelarducci, B., & Santarcangelo, E. L. (2005). Hypnotic modulation of flow-mediated endolethial response to mental stress [Abstract]. *International Journal of Psychophysiology, 55*(2), 221-227.

Jamieson, G. A. (2005). The modified Tellegen Absorption Scale: A clearer window on the structure and meaning of absorption. *Australian Journal of Clinical and Experimental Hypnosis, 33*(2), 119-139.

Jamieson, G. A. (2007). Absorption-PCI testing procedure: A script developed from fMRI hypnosis testing procedures. *Australian Journal of Clinical and Experimental Hypnosis, 35*(1), 95-97.

Jamieson, G. A., Dwivedi, P. & Gruzelier, J.H. (2005). Changes in mismatch negativity across pre-hypnosis, hypnosis and post-hypnosis conditions distinguish high from low hypnotic susceptibility groups. *Brain Research Bulletin*, *67*(4), 298-303.

Jamieson, G. A. & Loi, N. (2009, September). *Combining the internet and Phenomenology of Consciousness Inventory (PCI) for remote assessment of hypnotic abilities*. Paper presented at the International Society of Hypnosis XVIII International Congress, Rome.

Jamieson, G. A. & Sheehan, P. W. (2004). An empirical test of Woody and Bowers's dissociated-control theory of hypnosis. *International Journal of Clinical and Experimental Hypnosis, 52*(3), 232-249.

Jang, K. L., Paris, J., Zweig-Frank, H., & Livesley, W. J. (1998). Twin study of dissociative experiences *Journal of Nervous and Mental Disease, 186*(6), 345-351.

Jones, F. L. & McMillan, J. (2001). Scoring occupational categories for social research: A review of current practice, with Australian examples. *Work, Employment & Society, 15*(3), 539-563.

Kaiser, D. A. (2006). What is quantitative EEG? *Journal of Neurotherapy, 10*(4), 37-52.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*(1), 141-151.

Kalisch, R., Wiech, K., Critchley, H. D., Seymour, B., O'Doherty, J. P., Oakley, D. A., et al. (2005). Anxiety reduction through detachment: Subjective, physiological, and neural effects. *Journal of Cognitive Neuroscience, 17*(6), 874-883.

Kawachi, I. (1997). Heart rate variability. Retrieved from http://www.macses.ucsf.edu/Research/Allostatic/notebook/heart.rate.html

Kawasaki, H., Adolphs, R., Kaufman, O., Damasio, H., Damasio, A. R., Granner, M., et al. (2001). Single-neuron responses to emotional visual stimuli recorded in human ventral prefrontal cortex. *Nature Neuroscience, 4*(1), 15-16.

Kensinger, E. A. & Schacter, D. L. (2006). Processing emotional pictures and words: Effects of valence and arousal. *Cognitive, Affective, & Behavioral Neuroscience, 6*(2), 110-126.

Kent, A. & Waller, G. (1998). The impact of childhood emotional abuse: An extension of the Child Abuse and Trauma Scale. *Child Abuse & Neglect, 22*(5), 393-399.

Kent, A., Waller, G., & Dagnan, D. (1999). A greater role of emotional than physical or sexual abuse in predicted disordered eating attitudes: The role of mediating variables. *International Journal of Eating Disorders, 25*(2), 159-167.

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S.-L., T, et al. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine, 32*(6), 959-976.

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., et al. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry, 60*(2), 184-189.

Kihlstrom, J. F. (1985). Hypnosis. *Annual Review of Psychology, 36*, 385-418.

Kihlstrom, J. F. (1992). Dissociative and conversion disorders. In D. J. Stein & J. E. Young (Eds.), *Cognitive science and clinical disorders* (pp. 247-270). San Diego: Academic Press.

Kihlstrom, J. F. (2005). Dissociative disorders. *Annual Review of Clinical Psychology, 1*, 227-253.

Kihlstrom, J.F. (2008). The domain of hypnosis, revisited. In M.R. Nash & A.J. Barnier (Eds.), *Oxford handbook of hypnosis: Theory, research and practice* (pp. 21-52). Oxford: Oxford University Press.

Kihlstrom, J. F., Barnhardt, T. M., & Tataryn, D. J. (1992). Implicit perception. In T. S. Pittman & R. F. Bornstein (Eds.), *Perception without awareness: Cognitive, clinical, and social perspectives* (pp. 17 - 54). New York: The Guildford Press.

Kihlstrom, J. F., Glisky, M. L., & Angiulo, M. J. (1994). Dissociative tendencies and dissociative disorders. *Journal of Abnormal Psychology, 103*(1), 117-124.

Killcross, S. (2000). The amygdala, emotion and learning. *The Psychologist, 13*(10), 502-507.

Kim, S. H. & Hamann, S. B. (2007). Neural correlates of positive and negative emotion regulation. *Journal of Cognitive Neuroscience, 19*(5), 776-798.

Kirsch, I. & Lynn, S. J. (1995). The altered state of hypnosis: Changes in the theoretical landscape. *American Psychologist, 50*(10), 846-858.

Klinger, E. (1978). Modes of normal conscious flow. In K. S. Pope & J. L. Singer (Eds.), *The stream of consciousness: Scientific investigations into the flow of human experience* (pp. 225-258). New York: Plenum Press.

Klinger, E., Henning, V. R., & Janssen, J. M. (2009). Fantasy-proneness dimensionalized: Dissociative component is related to psychopathology, daydreaming as such is not. *Journal of Research in Personality, 43*(3), 506-510.

Koopman, C., Classen, C., Cardeña, E., & Spiegel, D. (1995). When disaster strikes, acute stress disorder may follow. *Journal of Traumatic Stress, 8*(1), 29-46.

Koopman, C., Classen, C., & Spiegel, D. (1994). Predictors of posttraumatic stress symptoms among survivors of the Oakland/Berkeley, Calif., firestorm. *The American Journal of Psychiatry, 151*(6), 888-894.

Kosslyn, S. M., Brunn, J., Cave, K. R., & Wallach, R. W. (1984). Individual differences in mental imagery ability: A computational analysis. *Cognition, 18*(1-3), 195-243.

Krebs, D., Berger, M., & Ferligoj, A. (2000). Approaching achievement motivation - Comparing factor analysis and cluster analysis. *Advances in Methodology and Statistics (Metodološki Zvezki), 16*, 147-171.

Kumar, V. K., Pekala, R. J., & Cummings, J. (1996). Trait factors, state effects, and hypnotizability. *International Journal of Clinical and Experimental Hypnosis, 44*(3), 232-249.

Kwekkeboom, K., Huseby-Moore, K., & Ward, S. (1998). Imaging ability and effective use of guided imagery. *Research in Nursing & Health, 21*(3), 189-198.

Lamontagne, H. (1983). *Study on the psychological effects of disasters on operational personnel.* Retrieved from http://deastres.unanleon.edu.ni/pdf2/2005/Marzo/pdf/eng/doc1591/doc1591.htm

Lane, R. D., Reiman, E. M., Bradley, M. M., Lang, P. J., Ahern, G. L., Davidson, R. J., et al. (1997). Neuroanatomical correlates of pleasant and unpleasant emotion. *Neuropsychologia, 35*(11), 1437-1444.

Lang, P. J. & Bradley, M. M. (2010). Emotion and the motivational brain. *Biological Psychology, 84*(3), 437-450.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). Motivated attention: Affect, activation, and action. In P. J. Lang, R. F. Simons & M. T. Balaban (Eds.), *Attention and orienting: Sensory and motivational processes* (pp. 97-135). Mahwah, N.J.: Lawrence Erlbaum Associates.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2005). *International Affective Picture System (IAPS): Instruction manual and affective ratings*. Technical Report A-6, The Center for Research in Psychophysiology, University of Florida.

Lang, P. J., Greenwald, M. K., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology, 30*(3), 261-273.

Lee-Teng, E. (1965). Trance-susceptibility, induction-susceptibility, and acquiescence as factors in hypnotic performance. *Journal of Abnormal Psychology, 70*(5), 383-389.

Leong, K. S., Mann, P., Wallymahmed, M., MacFarlane, I. A., & Wilding, J. P. H. (2000). Abnormal heart rate variability in adults with growth hormone deficiency. *Journal of Clinical Endocrinology & Metabolism, 85*(2), 628-633.

Libkuman, T. M., Otani, H., Kern, R., Viger, S. G., & Novak, N. (2007). Multidimensional normative ratings for the International Affective Picture System. *Behavior Research Methods, 39*(2), 326-334.

Linn, R. L. & Slinde, J. A. (1977). The determination of the significance of change between pre- and posttesting periods. *Review of Educational Research, 47*(1), 121-150.

Littleton, H., Horsley, S., John, S., & Nelson, D. V. (2007). Trauma coping strategies and psychological distress: A meta-analysis. *Journal of Traumatic Stress, 20*(6), 977-988.

Lobaugh, N. L., West, R., & McIntosh, A. R. (2001). Spatiotemporal analysis of experimental differences in event-related potential data with partial least squares. *Psychophysiology, 38*(3), 517-530.

Lowenthal, B. (2000, November). Child maltreatment: Effects on development and learning. In *Issues in early childhood education: Curriculum, teacher education, & dissemination of information.* Symposium conducted at the meeting of the Lilian Katz Symposium, Champaign, IL.

Lu, S., Zhao, H., Ju, K., Shin, K., Lee, M., Shelley, K., et al. (2008). Can photoplethysmography variability serve as an alternative approach to obtain heart rate variability information? *Journal of Clinical Monitoring and Computing, 22*(1), 23-29.

Luu, P. & Posner, M. I. (2003). Anterior cingulate cortex regulation of sympathetic activity. *Brain, 126*(10), 2119-2120.

Lynn, S. J. & Rhue, J. W. (1986). The fantasy-prone person: Hypnosis, imagination, and creativity. *Journal of Personality and Social Psychology, 51*(2), 404-408.

Lynn, S. J. & Rhue, J. W. (1988). Fantasy proneness: Hypnosis, developmental antecedents, and psychopathology. *American Psychologist, 43*(1), 35-44.

Lynn, S. J., Rhue, J. W., & Green, J. P. (1988). Multiple personality and fantasy proneness: Is there an association or dissociation? *British Journal of Experimental and Clinical Hypnosis, 5*(3), 138-142.

Lynn, S.J., Weekes, J.R., & Milano, M.J. (1989). Reality versus suggestion: Pseudomemory in hypnotizable and simulating subjects. *Journal of Abnormal Psychology, 98*(2), 137-144.

Marmar, C. R., Weiss, D. S., Metzler, T. J., & Delucchi, K. (1996). Characteristics of emergency services personnel related to peritraumatic dissociation during critical incident exposure. *American Journal of Psychiatry, 153*(7), 94-102.

Marmar, C. R., Weiss, D. S., & Metzler, T. J. (1997). The Peritraumatic Dissociative Experiences Questionnaire. In J. P. Wilson & T. M. Keane (Eds.), *Assessing psychological trauma and PTSD* (pp. 412-428). New York: The Guildford Press.

McCann, I. L. & Pearlman, L. A. (1990). Vicarious traumatization: A framework for understanding the psychological effects of working with victims. *Journal of Traumatic Stress, 3*(1), 131-149.

McCarroll, J. E., Ursano, R. J., Wright, K. M., & Fullerton, C. S. (1993). Handling bodies after violent death: Strategies for coping. *American Journal of Orthopsychiatry, 63*(2), 209-214.

McIntosh, A. R., Bookstein, F. L., Haxby, J. V., & Grady, C. L. (1996). Spatial pattern analysis of functional brain images using partial least squares. *NeuroImage, 3*(3), 143-157.

McIntosh, A. R. & Lobaugh, N. L. (2004). Partial least squares analysis of neuroimaging data: Applications and advances. *NeuroImage, 23*(Supplement 1), S250-S263.

McMillan, J. & Jones, F. L. (2000). The ANU3_2 scale: A revised occupational status scale for Australia. *Journal of Sociology, 36*(1), 64-80.

Merckelbach, H., Horselenberg, R., & Muris, P. (2001). The Creative Experiences Questionnaire (CEQ): A brief self-report measure of fantasy proneness. *Personality and Individual Differences, 31*(6), 987-995.

Merckelbach, H. & Muris, P. (2001). The causal link between self-reported trauma and dissociation: A critical review. *Behaviour Research and Therapy, 39*(3), 245-254.

Merckelbach, H., Muris, P., & Rassin, E. (1999). Fantasy proneness and cognitive failures as correlates of dissociative experiences. *Personality and Individual Differences, 26*(5), 961-967.

Moran, C. & Britton, N. R. (1994). Emergency work experience and reactions to traumatic incidents. *Journal of Traumatic Stress, 7*(4), 575-585.

Morris, J. S., Friston, K. J., & Dolan, R. J. (1997). Neural responses to salient visual stimuli. *Proceedings of the Royal Society of London B: Biological Sciences, 264*, 769-775.

Morris, J. S., Öhman, A., & Dolan, R. J. (1998). Conscious and unconscious emotional learning in the human amygdala. *Nature, 393*, 467-470.

Myers, S. A. (1983). The Wilson-Barber Inventory of Childhood Memories and Imaginings: Children's form and norms for 1337 children and adolescents. *Journal of Mental Imagery, 7*(1), 83-94.

Näring, G. W. B. & Nijenhuis, E. R. S. (2005). Relationships between self-reported potentially traumatizing events, psychoform and somatoform dissociation, and absorption, in two non-clinical populations. *Australian and New Zealand Journal of Psychiatry, 39*(11-12), 982-988.

Nash, M. R. & Lynn, S. J. (1985-1986). Child abuse and hypnotic ability. *Imagination, Cognition and Personality, 5*(3), 211-218.

Nash, M. R., Lynn, S. J., & Givens, D. L. (1984). Adult hypnotic susceptibility, childhood punishment, and child abuse: A brief communication. *International Journal of Clinical and Experimental Hypnosis, 32*(1), 6-11.

Newby, D. (2009). *Cognitive control: Modulating conflict between competing responses* (Unpublished doctoral dissertation). University of New England, Armidale, New South Wales, Australia.

Nijenhuis, E. R. S. (2000). Somatoform dissociation: Major symptoms of dissociative disorders. *Journal of Trauma & Dissociation, 1*(4), 7-32.

Nijenhuis, E. R. S., van der Hart, O., & Steele, K. (2010). Trauma-related structural dissociation of the personality. *Activitas Nervosa Superior, 52*(1), 1-23.

Nixon, R. D. V., Bryant, R. A., Moulds, M. L., Felmingham, K. L., & Mastrodomenico, J. A. (2005). Physiological arousal and dissociation in acute trauma victims during trauma narratives. *Journal of Traumatic Stress, 18*(2), 107-113.

Noyes Jr, R. & Kletti, R. (1977). Depersonalization in response to life-threatening danger *Comprehensive Psychiatry, 18*(4), 375-384.

Ott, U. (2007). States of absorption: In search of neurobiological foundations. In G. A. Jamieson (Ed.), *Hypnosis and conscious states: The cognitive neuroscience perspective* (pp. 257-270). Oxford: Oxford University Press.

Ott, U., Sammer, G., & Vaitl, D. (2002). Baroreflex responsiveness correlates with the trait of absorption. *International Journal of Psychophysiology, 45*(1-2), 16-17.

Palm, K. M., Polusny, M. A., & Follette, V. M. (2004). Vicarious traumatization: Potential hazards and interventions for disaster and trauma workers. *Prehospital and Disaster Medicine, 19*(1), 73-78.

Pascual-Marqui, R. D. (2002). Standardized low-resolution brain electromagnetic tomography (sLORETA): Technical details. *Methods and Findings in Experimental and Clinical Pharmacology, 24*(Supplement D), 5-12.

Pearlman, L. A. & Mac Ian, P. S. (1995). Vicarious traumatization: An empirical study of the effects of trauma work on trauma therapists. *Professional Psychology: Research and Practice, 26*(6), 558-565.

Pearlman, L. A. & Saakvitne, K. W. (1995). *Trauma and the therapist: Countertransference and vicarious traumatization in psychotherapy with incest survivors*. New York: W.W. Norton & Company.

Pekala, R. J. (1991a). *Quantifying consciousness: An empirical approach*. New York: Plenum Press.

Pekala, R. J. (1991b). Hypnotic types: Evidence from a cluster analysis of phenomenal experience. *Contemporary Hypnosis, 8*, 95-104.

Pekala, R. J., Angelini, F., & Kumar, V. K. (2001). The importance of fantasy-proneness in dissociation: A replication. *Contemporary Hypnosis, 18*(4), 204-214.

Pekala, R. J. & Forbes, E. J. (1997). Types of hypnotically (un)susceptible individuals as a function of phenomenological experience: Towards a typology of hypnotic types. *American Journal of Clinical Hypnosis, 39*(3), 212-224.

Pekala, R. J. & Kumar, V. K. (2007). An empirical-phenomenological approach to quantifying consciousness and states of consciousness: With particular reference to understanding the nature of hypnosis. In G. A. Jamieson (Ed.), *Hypnosis and conscious states: The cognitive neuroscience perspective* (pp. 167-194). Oxford: Oxford University Press.

Pekala, R. J., Kumar, V. K., Ainslie, G., Elliott, N. C., Mullen, K. J., Salinger, M. M., et al. (1999-2000). Dissociation as a function of child abuse and fantasy proneness in a substance abuse population. *Imagination, Cognition and Personality, 19*(2), 105-129.

Pekala, R. J., Kumar, V. K., & Marcano, G. (1995). Hypnotic types: A partial replication concerning phenomenal experience. *Contemporary Hypnosis, 12*, 194-200.

Pekala, R. J., Kumar, V. K., Maurer, R., Elliott-Carter, N., Moon, E., & Mullen, K. (2009). *Self-reported hypnotic depth as a function of suggestibility, expectancy, and trance state effects: Implications for understanding hypnotism.* Manuscript submitted for publication.

Pekala, R. J. & Levine, R. L. (1981-1982). Mapping consciousness: Development of an empirical-phenomenological approach. *Imagination, Cognition and Personality, 1*(1), 29-47.

Pekala, R. J., Steinberg, J., & Kumar, V. K. (1986). Measurement of phenomenological experience: Phenomenology of Consciousness Inventory. *Perceptual and Motor Skills, 63*(2), 983-989.

Pekala, R. J., Wenger, C. F., & Levine, R. L. (1985). Individual differences in phenomenological experience: States of consciousness as a function of absorption. *Journal of Personality and Social Psychology, 48*(1), 125-132.

Penny, W. D., Kiebel, S. J., Kilner, J. M., & Rugg, M. D. (2002). Event-related brain dynamics. *Trends in Cognitive Sciences, 25*(8), 387-389.

Phan, K. L., Fitzgerald, D. A., Nathan, P. J., Moore, G. J., Uhde, T. W., & Tancer, M. E. (2005). Neural substrates for voluntary suppression of negative affect: A functional magnetic resonance imaging study. *Biological Psychiatry, 57*(3), 210-219.

Pines, A. & Aronson, E. (1988). *Career burnout: Causes and cures*. New York: The Free Press.

Posner, M. I., Rothbart, M. K., Sheese, B. E., & Tang, Y. (2007). The anterior cingulate gyrus and the mechanism of self-regulation. *Cognitive, Affective, & Behavioral Neuroscience, 7*(4), 391-395.

Qualls, P. J. & Sheehan, P. W. (1981a). Role of the feedback signal in electromyograph biofeedback: The relevance of attention. *Journal of Experimental Psychology: General, 110*(2), 204-216.

Qualls, P. J. & Sheehan, P. W. (1981b). Imagery encouragement, absorption capacity, and relaxation during electromyograph biofeedback. *Journal of Personality and Social Psychology, 41*(2), 370-379.

Rainville, P. (2002). Brain mechanisms of pain affect and pain modulation. *Current Opinion in Neurobiology, 12*(2), 195-204.

Rainville, P., Carrier, B., Hofbauer, R. K., Bushnell, M. C., & Duncan, G. H. (1999). Dissociation of sensory and affective dimensions of pain using hypnotic modulation. *Pain, 82*(2), 159-171.

Rainville, P., Duncan, G. H., Price, D. D., Carrier, B., & Bushnell, M. C. (1997). Pain affect encoded in human anterior cingulate but not somatosensory cortex. *Science, 277*(5328), 968-971.

Ray, W. J., Keil, A., Mikuteit, A., Bongartz, W., & Elbert, T. (2002). High resolution EEG indicators of pain responses in relation to hypnotic susceptibility and suggestion *Biological Psychology, 60*(1), 17-36.

Raz, A., Kirsch, I., Pollard, J., & Nitkin-Kaner, Y. (2006). Suggestion reduces the Stroop effect. *Psychological Science, 17*(2), 91-95.

Raz, A., Shapiro, T., Fan, J., & Posner, M. I. (2002). Hypnotic suggestion and the modulation of Stroop interference. *Archives of General Psychiatry, 59*(12), 1155-1161.

Regehr, C., Goldberg, G., & Hughes, J. (2002). Exposure to human tragedy, empathy, and trauma in ambulance paramedics. *American Journal of Orthopsychiatry, 72*(4), 505-513.

Regehr, C., Hill, J., & Glancy, G. D. (2000). Individual predictors of traumatic reactions in firefighters. *Journal of Nervous and Mental Disease, 188*(6), 333-339.

Rhue, J. W. & Lynn, S. J. (1987). Fantasy proneness: Developmental antecedents. *Journal of Personality, 55*(1), 121-137.

Rhue, J. W. & Lynn, S. J. (1989). Fantasy proneness, hypnotizability, and absorption - A re-examination. *International Journal of Clinical and Experimental Hypnosis, 37*(2), 100-106.

Roche, S. M. & McConkey, K. M. (1990). Absorption: Nature, assessment, and correlates. *Journal of Personality and Social Psychology, 59*(1), 91-101.

Roelofs, K., Hoogduin, K. A. L., Keijsers, G. P. J., Näring, G. W. B., Moene, F. C., & Sandijck, P. (2002). Hypnotic susceptibility in patients with conversion disorder. *Journal of Abnormal Psychology, 111*(2), 390-395.

Ruscio, J. & Ruscio, A. M. (2008). Categories and dimensions advancing psychological science through the study of latent structure. *Current Directions in Psychological Science, 17*(3), 203-207.

Russell, J. A. & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin, 125*(1), 3-30.

Sanders, B. & Becker-Lausen, E. (1995). The measurement of psychological maltreatment: Early data on the Child Abuse and Trauma Scale *Child Abuse & Neglect, 19*(3), 315-323.

Santarcangelo, E. L., Balocchi, R., Scattina, E., Manzoni, D., Bruschini, L., Ghelarducci, B., et al. (2008). Hypnotizability-dependent modulation of the changes in heart rate control induced by upright stance. *Brain Research Bulletin, 75*(5), 692-697.

Santarcangelo, E. L. & Sebastiani, L. (2004). Hypnotizability as an adaptive trait. *Contemporary Hypnosis, 21*(1), 3-13.

Scaer, R. C. (2001). *The body bears the burden: Trauma, dissociation, and disease*. Binghamton, NY: Haworth Press.

Schupp, H. T., Cuthbert, B. N., Bradley, M. M., Cacioppo, J. T., Ito, T., & Lang, P. J. (2000). Affective picture processing: The late positive potential is modulated by motivational relevance. *Psychophysiology, 37*(2), 257-261.

Schupp, H. T., Junghöfer, M., Weike, A. I., & Hamm, A. O. (2004). The selective processing of briefly presented affective pictures: An ERP analysis. *Psychophysiology, 41*(3), 441-449.

Searle, J. R. (2000). Consciousness. *Annual Review of Neuroscience, 23*, 557-578.

Searle, J. R. (2004). *Mind: A brief introduction*. New York: Oxford University Press.

Sebastiani, L., Simoni, A., Gemignani, A., Ghelarducci, B., & Santarcangelo, E. L. (2003a). Autonomic and EEG correlates of emotional imagery in subjects with different hypnotic susceptibility. *Brain Research Bulletin, 60*(1), 151-160.

Sebastiani, L., Simoni, A., Gemignani, A., Ghelarducci, B., & Santarcangelo, E. L. (2003b). Human hypnosis: Autonomic and electroencephalographic correlates of a guided multimodal cognitive-emotional imagery [Abstract]. *Neuroscience Letters, 338*(1), 41-44.

Seligman, R. & Kirmayer, L. J. (2008). Dissociative experience and cultural neuroscience: Narrative, metaphor and mechanism. *Culture, Medicine and Psychiatry, 32*(1), 31-64.

Selvaraj, N., Jaryal, A., Santhosh, J., Deepak, K. K., & Anand, S. (2008). Assessment of heart rate variability derived from finger-tip photoplethysmography as compared to electrocardiography. *Journal of Medical Engineering & Technology, 32*(6), 479-484.

Sheehan, P. W. (1967). A shortened form of Betts' Questionnaire upon Mental Imagery. *Journal of Clinical Psychology, 23*(3), 386-389.

Sheehan, P. W., Ashton, R., & White, K. (1983). Assessment of mental imagery. In A. A. Sheikh (Ed.), *Imagery: Current theory, research, and application* (pp. 189-221). New York: John Wiley & Sons.

Sheehan, P. W., Donovan, P., & MacLeod, C. M. (1988). Strategy manipulation and the Stroop effect in hypnosis. *Journal of Abnormal Psychology, 97*(4), 455-460.

Sheehan, P. W. & McConkey, K. M. (1982). *Hypnosis and experience: The exploration of phenomena and process*. Hillsdale, N.J.: Lawrence Erlbaum Associates.

Sheehan, P. W. & Robertson, R. (1996). Imagery and hypnosis: Trends and patternings in effects. In R. G. Kunzendorf, N. P. Spanos & B. Wallace (Eds.), *Hypnosis and imagination* (pp. 1-17). Amityville, NY: Baywood Publishing Company.

Shor, R. E. (1959). Hypnosis and the concept of the generalized reality-orientation. *American Journal of Psychotherapy, 13*, 582-602.

Shor, R.E. (1960). The frequency of naturally occurring 'hypnotic-like' experiences in the normal college population. *International Journal of Clinical and Experimental Hypnosis, 8*(3), 151-163.

Shor, R. E. (1962). Three dimensions of hypnotic depth. *International Journal of Clinical and Experimental Hypnosis, 10*(1), 23-38.

Shor, R. E. (1979). A phenomenological method for the measurement of variables important to an understanding of the nature of hypnosis. In E. Fromm & R. E. Shor (Eds.), *Hypnosis: Developments in research and new perspectives* (2nd ed., pp. 105-135). New York: Aldine Publishing Company.

Shor, R.E. & Orne, E. C. (1962). *The Harvard Group Scale of Hypnotic Susceptibility*. Palo Alto, CA: Consulting Psychologists Press.

Sierra, M. & Berrios, G. E. (1998). Depersonalization: Neurobiological perspectives *Biological Psychiatry, 44*(9), 898-908.

Sierra, M., Senior, C., Dalton, J., McDonough, M., Bond, A., Phillips, M. L., et al. (2002). Autonomic response in depersonalization disorder. *Archives of General Psychiatry, 59*(9), 833-838.

Skrandies, W. (1990). Global field power and topographic similarity. *Brain Topography, 3*(1), 137-141.

Somer, E. & Braunstein, A. (1999). Are children exposed to interparental violence being psychologically maltreated? *Aggression and Violent Behavior, 4*(4), 449-456.

Song, S. (2006). Health: Mind over medicine. Retrieved from http://www.time.com/time/magazine/article/0,9171,1174707,00.html

Spiegel, D. (1997). Hypnosis in the treatment of posttraumatic stress disorders. In J. W. Rhue, S. J. Lynn & I. Kirsch (Eds.), *Handbook of clinical hypnosis* (pp. 493-508). Washington, DC: American Psychological Association.

Stern, R. M., Ray, W. J., & Quigley, K. S. (2001). *Psychophysiological recording* (2nd ed.). New York: Oxford University Press.

Sztajzel, J. (2004). Heart rate variability: A noninvasive electrocardiographic method to measure the autonomic nervous system. *Swiss Medical Weekly, 134*(35), 514-522.

Tabachnick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights, MA: Allyn & Bacon.

Tart, C. T. (1975). *States of consciousness*. New York: Dutton.

Tellegen, A. (1981). Practicing the two disciplines for relaxation and enlightenment: Comment on "Role of the feedback signal in electromyograph biofeedback: The relevance of attention" by Qualls and Sheehan. *Journal of Experimental Psychology: General, 110*(2), 217-226.

Tellegen, A. & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology, 83*(3), 268-277.

Tellegen, A., Lykken, D. T., Bouchard, T. J., Wilcox, K. J., Segal, N. L., & Rich, S. (1988). Personality similarity in twins reared apart and together. *Journal of Personality and Social Psychology, 54*(6), 1031-1039.

Teplan, M. (2002). Fundamentals of EEG measurement. *Measurement Science Review, 2*(2), 1-11.

Thomas, N. J. T. (1999). Are theories of imagery theories of imagination? An active perception approach to conscious mental content. *Cognitive Science, 23*(2), 207-245.

Thomas, R. (2009). Preparing front-line workers for psychological hazards. *National Safety Magazine, 5.* Retrieved from http://www.workplaceohs.com.au/NewsDetail.asp?ID=23152#*

Tomison, A. M. & Tucci, J. (1997, Spring). *Emotional abuse: The hidden form of maltreatment* (Issues in Child Abuse Prevention No. 8). Canberra, Australia: Australian Institute of Family Studies, National Child Protection Clearinghouse. Retrieved from http://www.aifs.gov.au/nch/pubs/issues/issues8/issues8.html#red.

Ulett, G. A., Akpinar, S., & Itil, T. M. (1971). Investigations of hypnosis utilizing induction by video tape. *Psychosomatics, 12*(4), 250-255.

Vaitl, D., Birbaumer, N., Gruzelier, J., Jamieson, G. A., Kotchoubey, B., Kubler, A., et al. (2005). Psychobiology of altered states of consciousness. *Psychological Bulletin, 131*(1), 98-127.

van der Hart, O. & Horst, R. (1989). The dissociation theory of Pierre Janet. *Journal of Traumatic Stress, 2*(4), 1-11.

van der Hart, O., van Dijke, A., van Son, M., & Steele, K. (2000). Somatoform dissociation in traumatized World War I combat soldiers: A neglected clinical heritage. *Journal of Trauma & Dissociation, 1*(4), 33-66.

van der Kolk, B. A. & McFarlane, A. C. (1996). The black hole of trauma. In B. A. van der Kolk, A. C. McFarlane & L. Weisaeth (Eds.), *Traumatic stress: The effects of overwhelming experience on mind, body, and society* (pp. 3-23). New York: Guildford Press.

Vastag, B. (2003). Scientists find connections in the brain between physical and emotional pain. *Journal of the American Medical Association, 290*(18), 2389-2390.

Velicer, W. F. (1976). Determining the number of components from the matrix of partial correlations. *Psychometrika, 41*(3), 321-327.

Verona, E., Patrick, C. J., Curtin, J. J., Bradley, M. M., & Lang, P. J. (2004). Psychopathy and physiological response to emotionally evocative sounds. *Journal of Abnormal Psychology, 113*(1), 99-108.

Waldo, T. G. & Merritt, R. D. (2000). Fantasy proneness, dissociation, and *DSM-IV* Axis II symptomatology *Journal of Abnormal Psychology, 109*(3), 555-558.

Waller, G., Hamilton, K., Elliott, P., Lewendon, J., Stopa, L., Waters, A., et al. (2000). Somatoform dissociation, psychological dissociation, and specific forms of trauma. *Journal of Trauma & Dissociation, 1*(4), 81-98.

Watanabe, E., Fukuda, S., & Shirakawa, T. (2005). Effects among healthy subjects of the duration of regularly practicing a guided imagery program. *BMC Complementary and Alternative Medicine, 5*(21). doi: 10.1186/1472-6882-5-21

Weber, D. L. (2004). *Event-related potential indices of attention and memory in post-traumatic stress disorder* (Unpublished doctoral dissertation). Flinders University, Adelaide, South Australia.

White, K., Sheehan, P. W., & Ashton, R. (1977). Imagery assessment: A survey of self-report measures. *Journal of Mental Imagery, 1*(1), 145-170.

Williams, J.D. & Gruzelier, J.H. (2001). Differentiation of hypnosis and relaxation by analysis of narrow band theta and alpha frequencies. *International Journal of Clinical and Experimental Hypnosis*, *49*(3), 185-206.

Williams, L. M., Kemp, A. H., Felmingham, K. L., Barton, M., Olivieri, G., Peduto, A., et al. (2006). Trauma modulates amygdala and medial prefrontal responses to consciously attended fear. *NeuroImage, 29*(2), 347-357.

Wilson, S. C. & Barber, T. X. (1981). Vivid fantasy and hallucinatory abilities in the life histories of excellent hypnotic subjects ("somnambules"): Preliminary report with female subjects.

In E. Klinger (Ed.), *Imagery: Volume 2, concepts, results, and applications* (pp. 133-149). New York: Plenum Press.

Wilson, S. C. & Barber, T. X. (1983a). The fantasy-prone personality: Implications for understanding imagery, hypnosis, and parapsychological phenomena. In A. A. Sheikh (Ed.), *Imagery: Current theory, research, and application* (pp. 340-387). New York: John Wiley & Sons.

Wilson, S. C. & Barber, T. X. (1983b). *Inventory of childhood memories and imaginings*. Framingham, MA: Cushing Hospital.

Wintre, M. G., North, C., & Sugar, L. A. (2001). Psychologists' response to criticisms about research based on undergraduate participants: A developmental perspective. *Canadian Psychology, 42*(3), 216-225.

Yeung, N., Bogacz, R., Holroyd, C. B., & Cohen, J. D. (2004). Detection of synchronized oscillations in the electroencephalogram: An evaluation of methods. *Psychophysiology, 41*(6), 822-832.

Zachariae, R., Jørgensen, M. M., Bjerring, P., & Svendsen, G. (2000). Autonomic and psychological responses to an acute psychological stressor and relaxation: The influence of hypnotizability and absorption *International Journal of Clinical and Experimental Hypnosis, 48*(4), 388-403.

Zald, D. H. (2003). The human amygdala and the emotional evaluation of sensory stimuli *Brain Research Reviews, 41*(1), 88-123.

Zuckerman, M., Persky, H., & Link, K. (1967). Relation of mood and hypnotizability: An illustration of the importance of the state versus trait distinction. *Journal of Consulting Psychology, 31*(5), 464-470.

Appendix A

A Re-Examination of the Factor Structure of the Inventory of Childhood Memories and Imaginings (ICMI)

While it was previously stated that the ICMI is a much used measure of fantasy proneness, little work has been conducted in order to discover its underlying factor structure. The fact that no-one had thought to examine this had been a concern for researchers for some time, as Lynn and Rhue stated in 1986. They, too, asserted that the ICMI is a useful measure of fantasy proneness as determined by its construct validity. However, Lynn and Rhue (1986) were concerned by its lack of discriminant validity as they claimed that the correlations between the ICMI and the absorption measure, the Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974), were too high (i.e., $r = .75$ for their sample). They therefore suggested that the TAS be used to screen individuals for their level of fantasy proneness until the factor structure of the ICMI could be determined. An investigation of the factor structure of the ICMI was finally carried out by Klinger, Henning, and Janssen in 2009.

Fellows and Wright (1989) suggested that the ICMI required modification of its scoring in order for individuals to be able to more accurately reflect their response and thus allow a more stringent measure of fantasy proneness. This modification was conducted by Hough (2006) who developed the ICMI-F. While the original ICMI is a 52-item measure developed by Wilson and Barber (1983b), and asks individuals to answer true or false to the questions posed, the ICMI-F, is a 49-item instrument employing a 5-point Likert scale asking the participant how often each of the listed experiences happened both in childhood and presently. The scale ranges from 0 (*Never*) to 4 (*Very often*) and the responses are calculated to create a total score out of 180. For the purposes of the current investigation the items in this section will refer to the original Wilson and Barber (1983b) version. It is important to note, however, that these original items differ slightly from the modified version both in wording and numbering.

Klinger et al.'s (2009) concern and rationale for conducting their investigation into the factor structure of the ICMI was that there have been results from previous studies indicating that fantasy proneness is related to psychopathology (e.g., Rhue & Lynn, 1987; Waldo & Merritt, 2000). However, Klinger et al. (2009) claim that the ICMI's items relate not just to dissociative or potentially psychopathological experiences, but also to ordinary daydreaming. An example of the former might include item 19, "As an adult, I still occasionally live in a make-believe world"

and an example of the latter is item 14, "At the present time, I am very imaginative." Klinger et al. (2009) thus believed that there was more than one dimension to this measure and so simply adding all the items together to create a total score did not capture this.

In order to examine the factor structure of the ICMI, Klinger et al. (2009) administered this and three other questionnaires, not pertinent to the current analysis, to 232 university students. After conducting a principal components analysis the researchers initially found up to18 components. This, they concluded, provided sufficient support for the contention that the ICMI is factorially complex. However, as components 3 to 18 were difficult to define, and because the first two components accounted for the majority of common variance with components 3 to 18 each accounting for less than 4% of the common variance, they believed that a two factor solution, with items loading .50 or more, was the most interpretable solution. Klinger et al. (2009, p. 508) characterised Component 1(seven items) as involving "…vivid imagery accompanied by alterations of consciousness and weakened boundaries between mental imagery and reality…." Component 2 (six items), on the other hand, reflected "…particular enjoyment of imagining, daydreaming, and others' imaginative narratives…" (Klinger et al., 2009, p. 510). The items contained in each component are as follows[34]: (a) Component 1(46, 29, 49, 37, 50, 17, 19) and (b) Component 2 (13, 22, 12, 31, 8, 14; Klinger et al., 2009).

For the amended Hough (2006) ICMI-F, the two components contain the following items:

[34] The item numbers are from the original ICMI (Wilson & Barber, 1983b). The factor table with the loadings for each item may be found in the original Klinger et al. (2009) article and are not reproduced here.

Table A1

Items in the Klinger et al. (2009) Two Component Model as Found in the Hough (2006) ICMI-F Version

Item Number	Component 1 Altered Consciousness
43	While listening to my music, in addition to experiencing mood changes (feeling calm, relaxed, energetic) I experience a transformation (a feeling of oneness with the music).
21	When I was a child, I would spend at least half of my waking day imagining.
46	When asked to close my eyes and pretend I am holding an animal (dog, cat) on my lap, I can experience it as if it were really there.
35	I have experienced premonitions (prophecy or foretelling the future) in a dream or while awake.
47	At times before I fall asleep, I experience vivid images.
13	When I was playing make-believe games as a child, I would imagine so vividly that what I pretended seemed real.
27	As an adult, I live in a make-believe world.
	Component 2 Imagination
10	When I was a child, I was very imaginative.
17	When I was a child, I would pretend <u>and in some sense believe</u> I was someone else such as a fairy tale or make-believe character like Snow White or Superman.
25	As an adult, I still enjoy fairy tales and ghost stories.
7	When I was a child, I believed in such things as fairies, ghosts, leprechauns or elves.
26	At the present time, I am <u>very</u> imaginative.

Note. There is one less item in Component 2 than was originally included in the Klinger et al. (2009) version. Item 31 ("If I could not imagine anymore, besides other effects it would have on my life, I wouldn't be me anymore – I would be a basically different person") is not included in Hough's (2006) amended ICMI-F.

While Klinger et al.'s (2009) analysis is sound in that it is quite apparent that the ICMI is much more factorially complex than initially thought given their discovery of at least two

interpretable components, the aim of the present investigation is to re-evaluate the latent factor structure of this measure using the original investigators' data.

Without access to the original raw data, an exploratory factor analysis was undertaken using the Klinger et al. (2009) correlation matrix and following the instructions for such an analysis provided by Zhang (2005). Following these instructions, a factor analysis employing a principal components extraction was conducted. Kaiser's (1960) eigenvalues greater than one rule indicated that 15 factors should be retained and Cattell's (1966) scree plot indicated approximately six factors. However, with the aim of interpretability being the paramount concern, all solutions between three and six factors (50% of the total variance) were assessed using PROMAX rotations. The rationale for choosing between three and six factors to interpret was to see if solutions beyond Klinger et al.'s (2009) original two components added to interpretability and amount of variance accounted for. Examining the resulting pattern matrices, it was determined that the three-factor solution was the most interpretable, explaining 34% of the total variance. While the four-factor solution accounted for a greater proportion of the total variance (i.e., 40.45%), it and subsequent solutions appeared uninterpretable and were not considered further.

Only those items loading above .4 were retained from the original 48 items[35] (n = 29). The individual items and their loadings can be found in Table A2. The factor analysis uncovered the following three dimensions:

1. *Altered state* (10 items). The items in this factor describe experiences associated with non-ordinary reality. Experiences such as precognition, being compelled to go somewhere or do something not associated with ordinary everyday actions, and the desire to experiment with mind-altering drugs are indicative of this factor.
2. *Imagination* (8 items). The items in this factor relate to experiences associated with imagination. Items such as believing in mythical entities, enjoying fairytales, and the ability to believe that one can pretend to be someone else describe this factor. This factor most closely resembles that found by Klinger et al. (2009).

[35] The first four items in the ICMI are "warm-up" items and are not scored. Thus from the original 52-item questionnaire, 48 items are examined.

3. *Vivid fantasy* (11 items). The items in this factor describe a kind of hyper-imagination. Items refer to experiences related to living in a make-believe world even in adulthood, spending much of the day imagining, and describing oneself as very imaginative.

Table A2

Principal Components Factor Analysis with PROMAX Rotation of Three-Factor Solution of Fantasy Proneness

Item	1 Altered State	2 Imagination	3 Vivid Fantasy
37. I have experienced precognition (prophesy or foretelling the future) in a dream or while awake. That is, I have known something would happen before it happened even though there was no rational way I could have known.	.76		
50. At times just before I fall asleep, I experience vivid images.	.60		
27. When I was a young (pre-teenage) child, I had sexual fantasies.	.52		
41. I have at times in my life experimented with marijuana, psychedelic drugs (LSD, etc.), amphetamines (“uppers”), tranquillisers (“downers”), or other such drugs in order to experience an altered state of consciousness; that is, in order to experience the world in a new way, not just to relax or feel good.	.51		
52. If I wish, I am usually able to finish or change a dream after I awaken.	.51		
40. I believe reincarnation is possible, and I have become aware of a life (or lives) that I may have lived prior to this one.	.48		
28. I have had an orgasm (or orgasms) just by imagining only.	.47		
26. When I was a child, or teenager, sometimes I was accused of lying when I was just reporting what I imagined.	.46		

10. When I was a child, I would dream or imagine I was flying with such vividness that I felt as if I actually did fly.	.45		
39. I have at times felt unexplainably compelled to go somewhere or do something I wouldn't ordinarily do (such as call someone I wouldn't ordinarily call) and then later discover there was a reason from my compulsion. (For instance the person I called desperately needed me at that moment).	.43		
8. When I was a child, I believed in such beings as fairies, leprechauns, or elves, etc.		.74	
22. When I was a child, I would at times pretend and in some sense believe I was someone else such as a fairytale character (e.g., Snow White, Peter Pan, Rapunzel, etc.), a prince or princess, an orphan, etc.		.71	
12. As an adult, I would still enjoy fairytales.		.67	
9. Now that I am an adult, I still in some sense believe in such beings as fairies, leprechauns, or elves, etc.		.59	
6. When I remember back to when I was 6, 7, or 8 years of age, I can re-experience myself as a child; that is, I can "see" and "hear" again what I saw and heard then and I can feel again the emotions and sensations I felt then.		-.54	
15. When I was a child, I was "a childhood philosopher". That is, I spent time thinking about such things as the meaning of life, and of death, about hypocrisy, levels of existence, etc.		-.53	
11. When I was a child, I enjoyed fairytales.		.47	
5. I can remember clearly one or more things that happened to me when I was two years of age or younger.		-.40	
19. As an adult, I still occasionally live in a make-believe world.			.72
48. I can vividly re-experience in my imagination such things as: the feeling of a gentle breeze, warm sand under bare feet,			.64

the softness of fur, cool grass, the warmth of the sun, and the smell of freshly cut grass.	
14. At the present time, I am very imaginative.	.63
30. Now as an adult, I spend a substantial part of my total waking day imagining.	.58
31. If I could not imagine anymore, besides other effects it would have on my life, I wouldn't be me anymore – I would be a basically different person.	.57
43. I think I am hypnotisable; that is, I think I could be hypnotised (or I have been hypnotised).	-.57
18. When I was a child, I lived in a make-believe world much or most of the time.	.53
49. When asked to close my eyes and imagine holding a baby or an animal (dog, cat, etc.) in my lap, I can experience it as if it were actually there. That is, I can feel its weight, touch it, see it, hear it, etc.	.52
17. When I was playing make-believe games as a child, I usually would imagine so vividly that what I pretended seemed real to me.	.50
25. When I was a child or teenager, at times I was afraid my imagining would become so real to me that I would be unable to stop it.	.48
29. When I was a child, I would spend at least half of my total waking day imagining.	.48

Note. These items are taken from the original Wilson and Barber (1983b) ICMI.

The correlations between the three factors are found in Table A3. These results indicate a medium positive relationship between the altered state factor and vivid fantasy with a small positive relationship between imagination and vivid fantasy.

Table A3

Correlation of the Three Factor Solution of the ICMI

Factor	1	2	3
1. Altered state	-		
2. Imagination	-.02	-	
3. Vivid fantasy	.32	.19	-

The amended ICMI-F (Hough, 2006) contains all of the above items except, as previously mentioned, item 31. In addition, the wording and numbering is slightly different. Thus the 28 items for the ICMI-F may be found in Table A4.

Table A4

Items Contained in the ICMI-F Three-Factor Solution

Item Number	Factor 1: Altered State
35	I have experienced premonitions (prophecy or foretelling the future) in a dream or while awake.
47	At times just before I fall asleep, I experience vivid images.
20	When I was a child (pre-teenager), I had sexual fantasies.
39	I have experienced marijuana, psychedelic drugs or some other drugs in order to experience an altered state of consciousness.
49	If I wish, I am usually able to finish or change a dream after I awaken.
38	I believe reincarnation is possible and I have become aware of a life (or lives) that I may have lived prior to this one.
29	I have had an orgasm (or orgasms) just by imagining only.
19	When I was a child or teenager, I was accused of lying when I was just reporting what I imagined.
8	When I was a child, I would dream or imagine I was flying with such vividness that I felt as if I actually did fly.
37	I have felt unexplainably compelled to go somewhere or to do something I would not ordinarily do, and later discovered a reason for my compulsion.

	Factor 2: Imagination
7	When I was a child, I believed in such things as fairies, ghosts, leprechauns or elves.
17	When I was a child, I would pretend and in some sense believe I was someone else, such as a fairy tale or make-believe character like Snow White or Superman.
25	As an adult, I still enjoy fairy tales and ghost stories.
24	As an adult, I still in some ways believe in such beings as fairies, ghosts, leprechauns, or elves.
6	I can remember back to when I was 6 to 8 years old, and re-experience myself as a child.
11	When I was a child, I was a "child philosopher," that is, I thought about the meaning of life or death, levels of existence, hypocrisy, etc.
9	When I was a child, I enjoyed fairy tales and ghost stories.
5	I can remember clearly one or more things that happened to me when I was two years of age or younger.
	Factor 3: Vivid Fantasy
27	As an adult, I live in a make-believe world.
45	I can vividly re-experience in my imagination such things as the feelings of a gentle breeze, warm sand under bare feet, the softness of fur, or the smell of freshly cut grass.
26	At the present time, I am very imaginative.
30	As an adult, I spend a large part of my total waking day imagining.
41	I think I can be hypnotised, or I have been hypnotised.
14	When I was a child, I lived in a make-believe world.
46	When asked to close my eyes and pretend I am holding an animal (dog, cat) on my lap, I can experience it as if it were really there.
13	When I was playing make-believe games as a child, I would imagine so vividly that what I pretended seemed real.
18	When I was a child or teenager, I was afraid my imagining would become so real to me that I would be unable to stop it.
21	When I was a child, I would spend at least half of my waking day imagining.

Appendix B

Task 1 (Baseline Condition) Images with Valence and Arousal Rating Means (and Standard Deviations) [1] *and Participants' Average Ratings (and Standard Deviations) for Each Image (N = 51)*

Trigger Code	Image Description	IAPS Identification Number	Valence (*SD*)	Arousal (*SD*)	Average Rating (*SD*)
51	Crying man	Internet	-	-	2.16 (0.78)
10	Mutilation	3062	1.87 (1.31)	5.78 (2.57)	2.75 (0.98)
11	Mutilation	3080	1.48 (0.95)	7.22 (1.97)	2.78 (0.92)
16	Dying man	3230	2.02 (1.30)	5.41 (2.21)	1.67 (0.84)
13	Mutilation	3150	2.26 (1.57)	6.55 (2.20)	2.73 (1.02)
18	Aimed gun	6230	2.37 (1.57)	7.35 (2.01)	1.75 (0.93)
19	Attack	6313	1.98 (1.38)	6.94 (2.23)	2.10 (0.83)
12	Burn victim	3100	1.60 (1.07)	6.49 (2.23)	2.57 (0.88)
52	Snake	1050	3.46 (2.15)	6.87 (1.68)	1.71 (1.01)
14	Mutilation	3168	1.56 (1.06)	6.00 (2.46)	2.59 (0.90)
23	Plane crash	9050	2.43 (1.61)	6.36 (1.97)	1.71 (0.76)
15	Baby with tumour	3170	1.46 (1.01)	7.21 (1.99)	2.76 (1.01)
27	Injured kitten	9561	2.68 (1.92)	4.79 (2.29)	2.22 (1.03)
20	Attack	6350	1.90 (1.29)	7.29 (1.87)	1.86 (0.69)
25	Dirty toilet	9301	2.26 (1.56)	5.28 (2.46)	1.69 (0.79)
17	Sick infant	3350	1.88 (1.67)	5.72 (2.23)	2.24 (1.01)
28	Man on fire	9635.1	1.90 (1.31)	6.54 (2.27)	2.82 (0.91)
32	Leg abscess	Internet	-	-	1.92 (0.87)
53	Spider	1200	3.95 (2.22)	6.03 (2.38)	1.51 (0.92)
36	Mutilation	Internet	-	-	2.31 (1.05)
38	Girl with anorexia	Internet	-	-	2.22 (0.90)
31	Dead baby	Internet	-	-	2.96 (0.92)
54	Vicious dog	1300	3.55 (1.78)	6.79 (1.84)	2.02 (0.95)

Trigger Code	Image Description	IAPS Identification Number	Valence (*SD*)	Arousal (*SD*)	Average Rating (*SD*)
40	Battered female	Internet	-	-	1.88 (0.82)
29	Baby seal	Internet	-	-	2.55 (1.01)
21	Attack	6540	2.19 (1.56)	6.83 (2.14)	1.96 (0.82)
22	Gang attack	6821	2.38 (1.72)	6.29 (2.02)	1.84 (0.86)
34	Birth defect	Internet	-	-	2.92 (0.93)
26	Injured soldier	9400	2.50 (1.61)	5.99 (2.15)	2.29 (0.99)
05	War	2683	2.62 (1.78)	6.21 (2.15)	1.86 (0.80)
30	Drug user	Internet	-	-	1.47 (0.61)
24	Dead body	9252	1.98 (1.59)	6.64 (2.33)	2.47 (0.97)
09	Burn victim	3053	1.31 (0.97)	6.91 (2.57)	3.34 (0.85)
39	Tsunami victims	Internet	-	-	1.90 (0.90)
07	Mutilation	3000	1.45 (1.20)	7.26 (2.10)	3.00 (0.98)
08	Open grave	3005.1	1.63 (1.19)	6.20 (2.54)	3.00 (0.98)
33	Gun aimed at dog	Internet	-	-	1.76 (0.97)
37	Murder scene	Internet	-	-	2.45 (1.05)
35	Gunshot victim	Internet	-	-	2.90 (1.06)
06	Crying child	2800	1.78 (1.14)	5.49 (2.11)	2.63 (0.96)

Note. [1] Lang et al. (2005). Those images marked as "Internet" were sourced from various online sites so valence and arousal means (and standard deviations) data are not available.
Images were rated on a scale ranging from 1 (*Low distress*) to 4 (*High distress*).
IAPS = International Affective Picture System

Appendix C

Task 2 (Trance Induction Condition) Images with Valence and Arousal Rating Means (and Standard Deviations) [1] *and Participants' Average Ratings (and Standard Deviations) for Each Image (N = 51)*

Trigger Code	Image Description	IAPS Identification Number	Valence (*SD*)	Arousal (*SD*)	Average Rating (*SD*)
51	Snake	1112	4.71 (1.70)	4.60 (2.44)	1.18 (0.43)
10	Mutilation	3063	1.49 (0.96)	6.35 (2.60)	2.86 (0.94)
15	Battered female	3181	2.30 (1.43)	5.06 (2.11)	1.84 (0.81)
11	Mutilation	3069	1.70 (1.41)	7.03 (2.41)	3.16 (0.92)
14	Dead body	3120	1.56 (1.09)	6.84 (2.36)	1.96 (0.90)
17	Attack	3530	1.80 (1.32)	6.82 (2.09)	1.84 (0.81)
12	Burn victim	3102	1.40 (1.14)	6.58 (2.69)	2.63 (0.98)
18	Aimed gun	6260	2.44 (1.54)	6.93 (1.93)	1.65 (0.89)
13	Burn victim	3110	1.79 (1.30)	6.70 (2.16)	2.33 (1.03)
19	Attack	6550	2.73 (2.38)	7.09 (1.98)	2.10 (0.86)
52	Spider	1205	3.65 (1.76)	5.79 (2.18)	1.53 (0.90)
22	Car fire	8485	2.73 (1.62)	6.46 (2.10)	1.73 (0.78)
20	Attack	6560	2.16 (1.41)	6.53 (2.42)	1.84 (0.83)
23	Starving child	9040	1.67 (1.07)	5.82 (2.15)	2.61 (1.00)
21	Suicide attempt	6570	2.19 (1.72)	6.24 (2.16)	1.96 (0.82)
24	Mutilation	9253	2.00 (1.19)	5.53 (2.40)	2.53 (0.86)
25	Vomit in toilet	9320	2.65 (1.92)	4.93 (2.70)	1.43 (0.78)
26	Mutilation	9405	1.83 (1.17)	6.08 (2.40)	2.24 (1.01)
27	Dead soldier	9420	2.31 (1.59)	5.69 (2.28)	2.42 (0.99)
29	Bird covered in oil	9560	2.12 (1.93)	5.50 (2.52)	1.55 (0.73)
28	Dead male	9433	1.84 (1.19)	5.89 (2.60)	2.24 (0.89)
53	Vicious dog	1525	3.09 (1.72)	6.51 (2.25)	1.75 (0.93)
30	Car accident	9910	2.06 (1.26)	6.20 (2.16)	1.67 (0.77)
32	Whale hunting	Internet	-	-	1.92 (1.03)

Trigger Code	Image Description	IAPS Identification Number	Valence (*SD*)	Arousal (*SD*)	Average Rating (*SD*)
33	Leg fungus	Internet	-	-	1.98 (0.91)
31	Starving dog	Internet	-	-	2.29 (0.92)
34	Operation	Internet	-	-	1.88 (0.89)
35	Riot	Internet	-	-	1.94 (0.83)
37	Birth defect	Internet	-	-	2.90 (0.90)
36	Drowned female	Internet	-	-	2.29 (1.06)
38	Murder scene	Internet	-	-	2.08 (0.89)
39	Violent gang	Internet	-	-	1.75 (0.80)
54	Sick baby	2053	2.47 (1.87)	5.25 (2.46)	1.76 (0.91)
06	Grieving female	2141	2.44 (1.64)	5.00 (2.03)	1.51 (0.73)
05	Sad toddler	2095	1.79 (1.18)	5.25 (2.34)	1.88 (0.79)
08	Mutilation	3010	1.71 (1.19)	7.16 (2.24)	2.71 (1.01)
07	Drug addict	2710	2.52 (1.69)	5.46 (2.29)	1.47 (0.70)
40	Starving child	Internet	-	-	2.57 (1.01)
09	Mutilation	3030	1.91 (1.56)	6.76 (2.10)	2.00 (0.85)
16	Tumour	3261	1.82 (1.34)	5.75 (2.64)	2.84 (0.95)

Note. [1] Lang et al. (2005). Those images marked as "Internet" were sourced from various online sites so valence and arousal means (and standard deviations) data are not available.
Images were rated on a scale ranging from 1 (*Low distress*) to 4 (*High distress*).
IAPS = International Affective Picture System

Appendix D

Trance Induction Transcript (Jamieson, 2007)

I want you to position yourself comfortably in your chair. Close your eyes and rest your hands on your lap. Now gently let yourself become aware of your stomach moving in and out in time with each breath. Just let yourself become aware of the natural rhythm of your breathing and the movement of your stomach in and out, in and out. That's right…hands comfortable now…as you continue to breathe freely and naturally.

I am about to give you some instructions that will help you let go of your concerns and to become more deeply involved in your internal experiences. I want you just to become aware of your breathing while you continue to listen to what I say. Your ability to become absorbed in your experience depends partly on your willingness to let go of other concerns and partly on your ability to be aware of my words and what I describe to you. Experience now the sensation of your chest rising and falling with each breath and continue to listen to my words, letting happen whatever you feel is taking place. Just let it happen.

Let go of your everyday thoughts and concerns. Instead let your awareness rest on the sensations of your breathing. Maintain your awareness of these sensations as steadily as you can. Should your mind wander away that will be all right…just bring your awareness gently back to your breathing. After a while you may find that you are no longer aware of the room in which you are sitting. You may feel that you are floating away, as though you were on a magic carpet taking you on a mysterious journey. Whatever happens just let it happen but continue to remain aware of your breathing for a while longer. There will come a time, however, when your body will feel itself floating away and you will no longer be aware of yourself sitting in this room. The everyday world will melt away. When this happens, just let it take place.

Allow yourself to feel the sensations of subtle energy that are moving through your body. Feel these sensations in your legs…and feet…Feel the subtle energy in your arms…Feel the sensations of energy in your hands…in your fingers…Feel the sensations of energy in your neck, and your chest…Feel this subtle energy moving throughout your entire body…Let yourself float in these sensations. Letting go of distracting thoughts. Letting go completely.

As you let go more and more, you may notice a feeling of lightness throughout your body. A sensation of subtle energy is flowing through your legs and your arms…through your feet and

hands…throughout your whole body. Your legs feel light, light as a feather…Your arms tingle…Your whole body feels as if it is composed of energy.

You float like an autumn leaf fluttering lightly in the breeze. You are letting go more and more. Your breathing has become natural and regular, natural, and regular. You are becoming more and more involved in this experience while the everyday world slips away.

You are becoming deeply immersed in this experience, but you are going to become even more involved, much more. Keep your eyes closed until I tell you to open them. Just keep listening to my voice. Listen only to my voice. Pay close attention to it. Keep your thoughts on what I am saying…listen carefully now. Soon you will be so deeply involved in this experience that even my voice may seem to come from far away, as if in a dream but you will continue to hear me. You will remain deeply immersed in this experience, until I ask you otherwise. I shall now begin to count. At each count you will feel yourself drifting further into this fascinating experience. One…you are going to become even more deeply aware…Two…drifting, drifting into this experience of deep immersion…Three…more and more, more and more deeply aware…Four…you are floating, floating into this experience of deep immersion. Nothing will disturb you. Pay attention only to my voice and to those things which you are presently experiencing. Five, Six…deeper and deeper…Seven…although deeply involved in your present experience you can clearly hear me. You will always hear me clearly no matter how deeply involved you may feel you are…Eight…deeply immersed in your present experience.

Any sounds will not disturb you. You are going to remain deeply immersed in your current experience. Perhaps you may feel like an astronaut piloting their spacecraft to a landing on a distant planet. Perhaps you may feel like you are warm and snug safe within a cocoon…Nine, Ten. Whatever you feel you will continue to remain deeply immersed in this experience until I ask you otherwise.

(Wait 15 seconds)

Alright now, please listen to me. I want you to make a mental note of what you were experiencing, what you were thinking and feeling while I have been talking to you. Afterwards I will ask you to complete a questionnaire in reference to your experience during this time. That's right, just take a moment now and take note of what you were thinking, feeling, and experiencing while I have been talking to you.

(Wait 15 seconds)

Continue to be aware of your present experiences but pay close attention to what I am going to tell you next. In a moment I shall begin counting backwards from ten to one. You will gradually return your focus to your ordinary awareness of the world. By the time I reach five you will open your eyes. When I get to one you will be fully focused and in your normal state of awareness, attending once again to the world around you and the tasks ahead. After you open your eyes, you will feel positive and alert, ready for the job ahead. I shall now count backwards from ten to one. At five, but not sooner, you will open your eyes and at one you will be fully focused and ready to move on to the next job…Ready, now: 10, 9, 8, 7, 6…halfway now, 5, 4, 3, 2, 1. You are now positive, focused and ready for action in your everyday state of awareness!