Chapter 1

General Introduction

Flow is an experience that transcends the normal, an "ecstatic" state consisting of a feeling of enjoyment and excitement when an activity comes together in an optimal sense of effortless unity between the body and mind (Csikszentmihalyi, 1999, p. 825). Flow-inducing activities provide graded challenges to create opportunities to act with motivation and skill, absorption in a task without self-conscious focus, and experience of deepening enjoyment and skills acquisition (Csikszentmihalyi, 1988, 1990; Csikszentmihalyi & LeFevre, 1989). Orlick (2000, p. 23) contends that the challenges that captivate, absorb, lift and stretch us also provide meaning and "give heart and passion to our pursuits". When engaged in the pursuit of a meaningful challenge, great satisfaction comes from embracing the present moment experience and feeling capable and composed. The exhilaration felt when stretched to one's capacity does not derive from a sense of conquering the challenge, rather it comes from embracing the experience as it unfolds and flows from present moment to moment (Orlick, 2000).

It is the self that provides the goals and source of interest creating the foundation allowing flow to develop (Nakamura & Csikszentmihalyi, 2005). Csikszentmihalyi (2000) contends that there are two basic ways a person may enter flow. The first entails engaging in structured activities that inherently induce flow such as sports that provide high complexity and structure. The second entails the use of attentional skills that enable flow, regardless of external conditions. Even a mundane task may yield flow if a sense of intrinsic motivation, interest, and a creative urge to develop a higher level challenge are generated. For example, Nakamura and Csikszentmihalyi (2005) suggest that although the activity of descending a staircase on foot may prove unengaging, by increasing complexity through, for instance, descending the staircase on a

skateboard, the new challenge forms as a catalyst to promote interest, motivation, and skill growth and, furthermore, beckons the opportunity to experience flow.

From a mountain biking perspective, the word flow is a common idiom used to convey the sensations of "… fast and skilful riding, feelings of euphoria and that happy satisfaction that comes from moments 'in the zone'. It is an experience so good that it draws us to the trails more times than we can count" (Bicknell, 2013, p. 76). These deep experiences of flow tend to stand out in our memory. For example, Csikszentmihalyi eloquently states:

> Yet we have all experienced times when, instead of being buffeted by anonymous forces, we do feel in control of our actions, masters of our own fate. On these rare occasions that this happens, we feel a sense of exhilaration, a deep sense of enjoyment that is long cherished and that becomes a landmark in memory for what life should be like. This is what we mean by optimal experience… moments like these, the best moments in our lives, are not the passive, receptive, relaxing times…The best moments usually occur when a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile. Optimal experience is thus something we make happen. (1990, p. 3)

As Bicknell's (2013) and Csikszentmihalyi's (1990) accounts of deep flow suggest, the values of enjoyment, satisfaction and a sense of control contribute to an athlete's active motivation, participation, and persistence. Seligman and Csikszentmihalyi (2000) argue that the enjoyment felt when breaking through new limits leads to personal growth and long-term happiness. Beyond the limited longevity of optimal performance outcomes and extrinsic rewards, flow contributes to the quality of one's life as a result of "endowing momentary experience with

value", and serving as a buffer against adversity to prevent pathology (Nakamura & Csikszentmihalyi, 2005, p. 102).

Although the challenges inherent in competitive sport can inspire and drive an athlete to reach a peak in personal potential, a potential that can yield the perception of a very positive present-moment experience (Jackson & Csikszentmihalyi, 1999; Waterman, 2007), oftentimes the enjoyment and true value inherent in competitive sport is lost. This is because, "Competition is enjoyable only when it is a means to perfect one's skills; when it becomes an end in itself, it ceases to be fun" (Csikszentmihalyi, 1990, p. 50). Csikszentmihalyi (1975) argues that "the addition spurious motivational elements to a flow activity" such as playing to win or playing for money can distract attention from the present moment activity by focusing on a fear of losing (p. 42).

When an athlete's present moment experience is monopolised by future-orientated thoughts of winning and past and present evaluations of self and others, this non-task specific focus may rob the athlete of the pure inherent joy, satisfaction, and inspiration found when simply participating in a sport or activity for its own sake (Jackson & Csikszentmihalyi, 1999). The experience of being mindfully engaged moment by moment within a meaningful task promotes enlightenment, discovery, meaningfulness, interest, and joy. When in pursuit of a meaningful sporting challenge, awareness of the importance of being present moment focused means that there is no way of failing, as being engaged in the present moment experience is the ultimate goal in and of itself (Orlick, 2000). Thus "ideally flow is the result of pure involvement, without any consideration about results" (Csikszentmihalyi, 1975, p. 42).

Although at times our unconscious negative judgements about the nature of reality are benign or impact minimally on life, there are times where these judgemental evaluations can

inhibit the possibilities that are open to us through interfering with mindful awareness (Hunter & Csikszentmihalyi, 2000). The cultivation of everyday mindfulness is linked to enhanced psychological health and well-being (Baer, 2009; Bränstrom, Duncan, & Moskowitz, 2011; Carmody & Baer, 2008; Gu, Strauss, Bond, & Cavanagh, 2015). Long term committed and valued action towards formal and informal mindfulness practice cultivates the observation of present moment experiences within a non-judgemental and non-reactive framework (Gardner & Moore, 2004). A mindful accepting attitude which promotes awareness and an open frame of mind may facilitate optimal attentional and emotional self-regulation which enhances present moment experience by reducing suffering and increasing equanimity, wisdom, compassion, and other positive qualities (Baer, 2009).

Applying mindfulness concepts to competitive sport is not novel. In an early study Kabat-Zinn and colleagues used a mindfulness-based intervention to promote greater performance in competitive rowers. Qualitative results indicated that the mindfulness-based training helped increase these elite athletes' performance (Kabat-Zinn, Beall, & Rippe, 1985). Yet, to date, there has been a dearth of mindfulness intervention research in athlete populations that has specifically focused on promoting more frequent occurrence of the subjective positive psychological experiences of flow. There has been next to no research relating to dispositional relationships in mindfulness and flow among competitive cyclists.

For most mountain bike riders, the sheer nature of riding fast over technical terrain provides the goal of simply being involved in the present moment activity for its own sake, without a sense of striving or without other reward or reason, much like the experience of flow itself (e.g., Csikszentmihalyi, 2000). Competitive cycling, in particular, mountain biking, requires a great degree of narrowly focused sustained attention and background awareness of

kinaesthetic movement and placement on and over the bike at all times in order to stay balanced and rolling fast. Tree roots, rocks, lose dirt, mud, off camber turns, and a host of situational psychological challenging factors pose threat of unseating the unfocused rider. Constant awareness and focused attention is needed to judge from one moment to the next which gear must be used to suit the terrain and attention must be paid to environmental cues in order to know when and where to brake or gather speed.

Vital to a rider's attainment of an optimal experience is a heightened awareness of and sensitivity to environmental, spatial, and kinaesthetic feedback stimuli that intertwine in a process of cause and effect that provides a continual shift in challenge that requires intention of action to meet this shift. In partnership with a background of mindful awareness, in the foreground sustained attention must be narrowly focused on vital cues and feedback information to maintain synchronicity between body, mind, and machine. This is consistent with Hunter and Csikszentmihalyi (2000) who suggest that in order to experience optimal moments it is vital that attention and awareness of information emanating from the environment and body need to be received as clear feedback and not tainted by cognitive or emotional focus relating to ego maintenance or ambiguous interpretation of stimuli.

A judgemental attitude towards internal and external stimuli can impede this optimal process. When focused attention drifts to daydreaming or is hijacked by ruminative thoughts – a focus on others, judgemental behaviour, self-expectations, self-conscious awareness brought about by an overriding or questioning ego, a sense of increased self-doubt and anxiety – a decrease in motivation and persistence may be experienced. Hence sustained attention and emotional self-regulation need to be ideally cultivated to promote optimal experiential states.

However, most people do not know how to concentrate their attention except under the most favourable of circumstances (Csikszentmihalyi, 1978).

The aim of the current thesis is to expand on the literature and research pertaining to the optimal psychological experience of flow in competitive sport by examining the effect of mindfulness training on increasing the occurrence of flow. Nakamura and Csikszentmihalyi (2005) argue that some sports provide greater opportunity to balance skill against challenges due to their inherent goal and feedback structure than other sports and, accordingly, are more likely to facilitate flow. Moreover, sports that are of an endurance nature oftentimes elicit a dissociative focus of attention strategy that is used to help distract an athlete's attention away from anxious and pessimistic thoughts and sensation pertaining to salient physical discomfort (e.g., Connolly & Janelle, 2003; Couture, Jerome, & Tihanyi, 1999; Kress & Statler, 2006; Mallett & Hanrahan, 1997). From this perspective, a mindless dissociated focus of attention will impede processes of satisfying conditions of flow and disrupt attention focus when in flow (Jackson, 2000; Jackson & Csikszentmihalyi, 1999). Based on these premises, competitive cycling may provide the inherent challenges, structure, and differing levels of complexity that allow flow to occur provided an enhanced self-regulation of attention and an accepting attitude is attained.

Evidence suggests that formal mindfulness training (Carmody, Baer, Lykins, & Olendzki, 2009) along with the informal mindfulness practice of being mindful of everyday activities (Kabat-Zinn, 2009) enhances dispositional mindfulness. Moreover, evidence suggests high dispositional mindfulness may promote greater occurrence of flow in athletes through the process of enhancing self-regulation of attention and emotion processes (e.g., Aherne, Moran, & Lonsdale, 2011; Cathcart, McGregor, & Groundwater, 2014; Kaufman, Glass, & Arnkoff, 2009; Kee & Wang, 2008; Moore, 2013; Schwanhausser, 2009).

Chapter 2

Literature Review: Conceptual and Methodological Issues in Research on Flow

When athletes describe experiencing an optimal moment in sport, there is an observed consistency in the use of phrases that include: “an enjoyable moment”, “an exhilarating moment in time”, “I felt a sense of freedom”, “my mind and body were working as one effortlessly”, “I felt totally in control of my game”, “I hit the sweet spot”, “everything just clicked”, “I was in the zone” or “I was in the groove” (e.g., Jackson & Csikszentmihalyi, 1999). Optimal psychological experiences in sport more often involve a perception of being deeply absorbed in a present moment task at hand to the point where a narrow concentration of attention yields a sense of transcending the ordinary, a moment in time that seems altered in some way (Jackson & Csikszentmihalyi, 1999; Jackson & Wrigley, 2004).

Oftentimes an egoless union between body and mind gives rise to a sense of strength and control over the task challenge in a moment where worry and a fear of failure are of no concern (Csikszentmihalyi , 1975). Ultimately, in collaboration, these elements produce an effortless and enjoyable *flowing* sensation, an experience that is very rewarding in and of itself (Jackson & Csikszentmihalyi, 1999). What all these experiential accounts have in common is that they exemplify elements of what Csikszentmihalyi (1975) conceptualised as the optimal psychological experience of *flow*. As suggested, flow is intrinsically rewarding and motivating and leads to persistence in sport. Although flow is commonly associated with optimal performances in sport, it is, however, not necessarily deemed a precondition of optimal performance (Jackson, 2000; Jackson & Csikszentmihalyi, 1999).

Given the inherent reward flow offers, it is of no surprise that for any athlete flow is a highly coveted experience. The desire to experience flow through striving towards this state

paradoxically impedes the occurrence of this spontaneous and elusive optimal present moment experience. This paradox is supported by the documented comments of athletes who have attempted to control or force the occurrence of flow, which leads to the impediment or disruption of flow (Jackson & Csikszentmihalyi, 1999). Although suggesting it is generally not possible to make flow happen at will, Jackson and Csikszentmihalyi argue that an athlete can increase the occurrence of experiencing flow more frequently by removing obstacles and by developing facilitative skills that satisfy pre-conditions of flow.

Attentional Self-regulation

Flow literature suggests that learning to listen to one's body within a non-judgemental accepting attitude inhibits the questioning ego that criticises and doubts one's ability to perform the task successfully. Jackson and Csikszentmihalyi (1999, p. 68) state, "Letting go of this judge frees an athlete to become totally absorbed in the task at hand. More energy is available for the performance, and confidence is not weakened when the ego has no access to attention". Yet it must be reiterated that without a narrow concentrated attention focus "the mind lacks the one-pointedness to maintain full awareness of the present" (Hunter & Csikszentmihalyi, 2000, p. 13). To reemphasise, the main rationale presented here is that conditional elements of flow must be contingent on each other to be effective. Without this symbiosis "goals are meaningless without skills. Challenges lose vigor if an athlete has no feedback from which to judge his performance. Hunter and Csikszentmihalyi, (2000, p. 14) suggest "Concentration is the glue that holds the whole experience together and coordinates the various sensations". However, even when the opportunity is present, most people do not know how to concentrate attention except under the most favourable of circumstances; therefore people rarely feel the enjoyment that inherently accompanies the experiential state of flow (Csikszentmihalyi, 1978). Yet:

> When we commit ourselves to paying attention in an open way, without falling prey to our likes and dislikes, opinions and prejudices, projections and expectations, new possibilities open up and we have a chance to free ourselves from the straightjacket of unconsciousness. (Kabat-Zinn, 1994, p. 6)

Factors Influencing Flow

Flow research suggests that perceived high confidence in one's skills and abilities to match an impending high challenge is a principal factor in the attainment of flow (Jackson, Kimiecik, Ford, & Marsh, 1998; Jackson, Thomas, Marsh, & Smethurst, 2001; Jackson & Roberts, 1992). Linked to confidence, a positive self-concept (Jackson et al., 2001) and intrinsic motivation (Jackson et al., 1998; Kowal & Fortier, 1999) have been identified as specific positive correlates of flow. Additionally, Jackson (1992) found that for elite figure skaters a positive mental attitude, sustained attention focus, and an ability to emotionally regulate affect were factors associated with experiencing a flow state. Similarly, Catley and Duda (1997) found evidence supporting the suggestion that greater pre-performance psychological readiness facilitated flow via the mastering of self-regulation skill through attentional and emotional buoyancy.

Csikszentmihalyi (1990) identified a personality type that may create a predisposition for experiencing flow. Termed the autotelic personality, Csikszentmihalyi and colleagues (see Csikszentmihalyi & Csikszentmihalyi, 1988) suggested that some people have superior abilities to concentrate attention and are open to new experience, and thus are motivated to engage in a challenging task simply out of the pure inherent enjoyment of being engaged in the activity. These individuals are more inclined to experience flow frequently. Research has supported an autotelic personality as a factor that facilitates flow (Jackson et al., 1998). In connection with

findings such as there being no significant difference between genders in occurrence of flow (e.g., Cathcart et al., 2014; Russell, 2001), Jackson (2000) suggests flow may occur for any person provided that the performer has optimally balanced his or her personal equation for key flow conditions. Hence, each person's flow experience may be different.

Performance anxiety may be one factor that disrupts flow (Jackson, 1995; Jackson & Csikszentmihalyi, 1999; Jackson & Roberts, 1992; Jackson et al., 1998, Nakamura & Csikszentmihalyi, 2005). Another factor associated with low flow is pessimism. Catley and Duda (1997) found that feelings of pessimism – negatively related to golfers' pre-round psychological readiness states such as feelings of calmness, confidence, and positive focus – was associated with less flow frequency and intensity. Anxiety and pessimism will be reviewed in more detail in a later section of this chapter.

Jackson and Wrigley (2004) pointed to areas on which flow research can profitably focus, including athlete dispositional qualities that may increase personal abilities to experience flow. For example, research might examine factors pertaining to one's ability to self-regulate concentration more deeply to become absorbed in the task at hand or focus on general emotional and motivational tendencies that may impede flow. Further, these authors question whether a competitive compared to a non-competitive recreational environment differentiate findings relating to flow in sport. For example, there is a need to further look into competitive environments that emphasise a focus on winning and maintaining self-esteem which may shift attention focus away from important feedback stimuli to non-relevant emotional feedback that disrupts an athlete's ability to experience flow.

Flow Intensity

Beyond the factors that may affect the frequency of flow occurrence, Csikszentmihalyi

(1990) suggests different activities facilitate differing levels of flow intensity. Intensity can range on a continuum from low to high, with ends termed microflow and macroflow, respectively. Microflow experiences relate to short and superficial episodes which are generally promoted by everyday low complex activities such as reading the paper or listening to music. Flow is rarely experienced in relation to passive activities such as relaxing or watching television. Macro or deep-flow experiences are characterised by longer more vivid and intense episodes that are memorable. Deep-flow experiences are promoted by highly complex and structured activities such as those inherent in most competitive sports. Csikszentmihalyi (1975) suggests that the macro or deep *visionary* experiences of flow are a much a rarer state than that of microflow states.

Optimal Experience versus Peak Experience

The concept of peak experience (Maslow, 1968) has been discussed in relation to being an interchangeable or overlapping construct with that of Csikszentmihalyi's (1975) optimal experience of flow. For example, Jackson and Wrigley (2004) suggested that peak experience and optimal experience of flow seem to have some overlapping or co-occurring characteristics. These authors consider it more useful to view peak experience as a component rather than being synonymous with the multi-dimensional construct of flow. For example, the affective nature linked to the feeling of pleasure that is inherent to peak experience may be aligned with the autotelic experience of enjoyment as a by-product of experiencing a flow state. Jackson and Wrigley further delineate these constructs by suggesting two significant conceptual differences. The first is the view that peak experience appears to be aligned with a hedonistic viewpoint while the optimal experience of flow reflects a eudemonic engagement with effort, challenge, self-actualisation, and functionality forming its core. This view is consistent with Keller and Bless

(2008) who suggest peak experiences tend to be perceptual, receptive, and passive in nature while flow is contingent on an interactive engagement with the environment through a volitional application of personal skill in challenging situations. Moreover, Jackson and Wrigley (2004) state that the concept of flow contains not only an affective component, it also includes cognitive elements such as an active balancing of skills with challenges, defining and setting clear goals, and directing intense concentrated attention towards the task at hand.

Flow versus Contemplation

The ability to self-regulate attention and related emotional responses is a vital requirement for optimal sport experience and performance. When daydreaming or contemplating problems, a person's attention is focused outside the present moment. When present moment experience is given value by the sense that one is operating at an optimal level both physically and mentally, the experience of flow leaves a person with the sense that he or she would prefer to be in no other place or time but in the present moment experience (Hunter & Csikszentmihalyi, 2000).

Multi-dimensional Construct of Flow

As conceived by Csikszentmihalyi (1975), and supported by research pertaining to elite athletes' qualitative descriptions of being in flow (Jackson, 1992, 1995, 1996), the "golden" characteristic setting the stage for a flow state experience is the perceived matching of skills and challenge (Jackson & Csikszentmihalyi, 1999). Jackson (2000) suggests that skills and challenges must be well above an athlete's usual level, extending the athlete to his or her limit. Critical to this *challenge-skills balance* is the core belief that a goal is achievable. Despite facing an extreme (realistic) challenge, it is vital the athlete has an innate confidence in his or her well-honed and prepared skills in order to know that the challenge is achievable and suitably matched

by skill. Nakamura and Csikszentmihalyi (2005) suggest that the task of perceiving a balance between appropriate challenges and skills can be intrinsically fragile.

If the challenge is perceived as overwhelmingly high and individuals perceive their skill to be too low, then a state of anxiety may occur. Conversely, if skills and challenge are believed to be low, then a state of apathy may occur. A state of relaxation or boredom is also possible if the athlete's perceived skills are high and the perceived challenge is low (Jackson & Csikszentmihalyi, 1999). Therefore, by identifying the correct match between perceived high challenge and perceived high skills an athlete may regulate (increase or decrease) one of these factors to achieve an optimum balance, thus facilitating flow (see Figure 2.1).

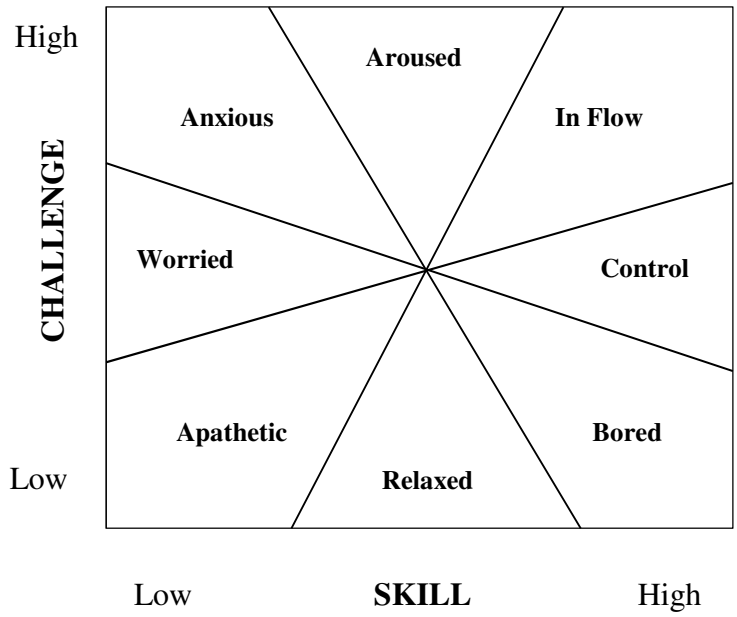

Figure 2.1. 8-channel model of flow adapted from Massimini and Carli (1988, p. 270)

The second dimension, *action-awareness merging*, is described as a sense of *oneness* between body and mind with a spontaneous or acute automatic response of timing and movement to immediate situational cues while operating at one's upper limits of capacity. Moreover, because of the deep focus on the task at hand, the athlete ceases to be aware of the self as a

separate agent from the task being performed (Jackson, 2000; Nicholls, Polman, & Holt, 2005). Thus, action-awareness merging, like other dimensions of flow, has a reciprocal relationship with elements such as challenge-skills balance, total concentration, and unambiguous feedback and clear goals (Jackson & Csikszentmihalyi, 1999).

The *clear goals* dimension requires a sense of clarity when dealing with a task rather than vague or random thoughts. Jackson and Marsh (1996) claim that in order to experience flow a person needs to have a strong sense of direction or a blue-print of sorts. Similarly, during the activity athletes must monitor and adjust their goals as the task requires by using a strong positive intuition about the planned outcome. Without tightly defined goals an athlete may find that unimportant events enter awareness and lead to concentration disruptions (Hunter & Csikszentmihalyi, 2000). A clear sense of moment-by-moment goal awareness and intention is thought to strengthen attention skills to facilitate a deep level of focused concentration on the task at hand by reducing unwanted distractions such as attention focused on second guessing one's competence in achieving the goal (Jackson & Csikszentmihalyi, 1999).

The *unambiguous feedback* dimension of flow relates to the moment-by-moment feedback that is presented by body movements and sensations (kinaesthetic awareness) and environmental cues which immediately and clearly inform the athlete of successful progress towards a goal. This process requires ongoing appraisal and, if needed, a reappraisal of performance in relation to meeting goals (Jackson & Csikszentmihalyi, 1999). Although unambiguous feedback is vital for guiding present moment performance, it is important that the focus placed on the stimulus remain non-elaborative and non-self-judgemental. That is, when perceived errors occur, an inappropriate self-judgemental focus may trigger an evaluative

cognitive process that raises self-doubt and a preoccupation with outcome as opposed to remaining focused on the present moment task at hand (Russell, 2001).

The dimension that is the clearest indicator of a flow state is *concentration on the task at hand.* A deep concentration on the task reduces the tendency to be distracted by others (Jackson & Csikszentmihalyi, 1999). Thus, by focusing on present moment-by-moment task-relevant stimuli and not projecting thoughts towards future outcomes or rumination of past experiences, the athlete can maintain an optimal sense of effortless sustained concentration, which enables freedom from usual worries (Jackson, 2000).

The *sense of control* dimension of flow is defined as being in control of the task without actively trying to apply control. Jackson (2000) suggests that, in reality, athletes are not in total control because if they were their skills would outweigh the challenge and the athlete would fall out of flow into a state of boredom. Csikszentmihalyi (1990) suggests the critical factor in relation to the control paradox is the athlete's ability to exercise control over difficult circumstances to regain a sense of balance which is fuelled by an innate sense of trust in his or her abilities. For example, knowing the task is attainable no matter what and believing nothing will go wrong may instil trust (Jackson & Marsh, 1996).

When in flow, athletes act instinctively and confidently, performing naturally through a seemingly innate sense of self-awareness in their body movement and sensations. Thus, the *loss of self-consciousness* dimension of flow is defined as becoming one with the activity without concern for one's self (Jackson & Marsh, 1996). Jackson (2000) suggests that "what recedes [in flow] is the evaluative and questioning ego" (p. 143). This is because when in flow, all attention is invested in the deployment of the task at hand, thus there is no "left over psychic energy to worry about the self" (Hunter & Csikszentmihalyi, 2000, p. 14).

The *transformation of time* dimension is typically explained as time becoming irrelevant or out of one's awareness. An athlete may report time as standing still or slowing down enabling precise execution of a movement or time to think. Alternatively, athletes may report time as speeding up, creating the perception the activity only lasted a moment (Jackson & Csikszentmihalyi, 1999). Although the transformation of time dimension may be a clear indicator that something special has occurred, for some athletes an accurate awareness of time is vital to guide performance. For example, a time trial cyclist may rely on time splits being relayed in order to guide performance to coincide with a clear race plan and goals. There is also the chance that a dissociative focus of attention (mind drifting to thoughts unrelated to the direct task at hand) may provide a sense that time has flown past in retrospect which is an experience not related to flow and is suggestive of poor attention focus. It may be that awareness of time may be a less salient feature for some athletes, for example, swimmers, than others (Kowal & Fortier, 1999). Thus, Jackson (2000) suggests the transformation of time dimension appears equivocal, with a low endorsement by some athlete populations.

Jackson and Eklund (2004) suggested that based on the low endorsement of the transformation of time dimension (e.g., Jackson & Marsh, 1996; Jackson et al., 1998; Jackson et al., 2001; Jackson & Eklund, 2002; Kowal & Fortier, 1999), researchers may wish to consider excluding the transformation of time dimension when evaluating global flow – as measured on the Dispositional Flow Scale and Flow State Scales-2 (DFS-2, FSS-2; Jackson & Eklund, 2002) – especially if this element does not nest well with a specific research sample.

Finally, the *autotelic experience* dimension of flow is conceptualised as positive affect (i.e., enjoyment, excitement, and intrinsic motivation) commonly felt by experiencing the end product of all the other characteristics of flow. The word autotelic is a derivative of two Greek

words, *auto* and *telos*, meaning self and goal, respectively. Positive autotelic sensations lead to a desire to perform the activity again for its own sake (Jackson et al., 1998) with no future expectation of reward or gain (Jackson & Marsh, 1996). Oftentimes the autotelic experience provides the motivation to keep pushing towards new and higher limits that in effect create a new platform for flow to develop (Jackson & Eklund, 2004).

The flow process seems reciprocally reinforcing in that flow provides intrinsic value (i.e., motivation and enjoyment) and skill growth while the presence of intrinsic motivation provides the impetus to persist due to the enjoyment felt when participating in the activity for its own sake. This process provides the opportunity to engage with demanding challenges with a strong sense of confidence in growing skill which collectively provides the core foundation for a flow state experience (Jackson & Csikszentmihalyi, 1999).

Reformulation of a Global Flow Model: Two Higher Order Factor Structure of Flow

Flow theory suggests that there are conditional steps or proximal factors that, if satisfied, can set the foundation for a flow experience. Csikszentmihalyi (1990) proposed that for even for the simplest physical act to produce flow, a person must first satisfy the essential steps of: (a) setting an appropriate overall goal that contains provision for as many sub-goals as feasible; (b) finding a way of measuring the progress of the chosen goals; (c) maintaining concentrated attention for the task at hand while making further finer distinctions pertaining to the challenge; (d) developing the skills that are necessary to interact with and manage the challenge at hand; and (e) raising the stakes when the challenge becomes boring. Csikszentmihalyi (1975, 1990) first postulated a progressive set of psychological conditions for flow and Nakamura and Csikszentmihalyi (2005) later classified the flow dimensions of challenge-skill balance, unambiguous feedback, and clear goals as *proximal conditions,* while the subjective state of

being in flow was characterised (flow characteristics) by the flow dimensions of concentration on the task at hand, action-awareness merging, loss of self-consciousness, sense of control, transformation of time, and autotelic experience. The recent suggestion that the dimension of concentration could be considered a condition of flow rather than a characteristic of a flow state experience (Swann, Keegan, Piggott, & Crust, 2012) is a seemingly valid argument given that Csikszentmihalyi (1978) suggests that a wilful narrow focus of attention is vital to the process of attaining flow.

Recent research by Kawabata and Mallett (2011) found support for the "proximal" flow conditions theory. Kawabata and Mallett's results suggest that optimally satisfied proximal conditions of flow facilitate the activation of constituents of a state of being in flow (flow characteristics) via sequential path relationships. These authors further state that the constituents of the proximal conditions (i.e., clear goals, unambiguous feedback, and challenge-skill balance) are a reflection of flow and "should be utilized to define flow experience" (p. 401).

Measuring Flow

Csikszentmihalyi (1992) has expressed concern over the difficult to assess the subjective experience of flow. It is argued that there is no one measurement method to comprehensively assess all possible facets of flow (Csikszentmihalyi, 1992; Jackson & Wrigley, 2004). Despite a general agreeance among flow researches over the definition of flow itself, there still remains to this day debate over how flow should be reliably measured (Moneta, 2012). Csikszentmihalyi's (1975) early research on qualitative descriptions of flow set the stage for later advances in qualitative and quantitative methods of the measurement of flow.

Through Csikszentmihalyi's initial interviews process focusing on descriptive comments made by rock climbers, rock dancers, chess players, and medical surgeons subjective accounts of

optimal experiences when engaged deeply in these activities, a conceptual structure of flow took shape. Csikszentmihalyi and Larson (1987) later used a brief flow questionnaire along with a method of experiential sampling to assess flow in everyday life, which was also used later in a series of studies to assess optimal experiences in an array of life domains (see Csikszentmihalyi & Csikszentmihalyi, 1988).

Experiential Sampling Method (ESM) entails a systematic measurement of a person's experiences within the natural course of the day through prompts initiated by a beeper or a wristwatch signal, that can be received randomly at multiple times of day, at which time the flow questionnaire would be fill out. The use of the ESM enabled Csikszentmihalyi and Larson (1987) the ability to evaluate the magnitude, duration and sequence of experiential states, along with an examination of "correlations between the occurrences of different experiences" (p. 533). Despite the effectiveness of the ESM coupled with the flow questionnaire to tap flow experiences, this method also had an inherent limitation in relation to capturing flow experiences in sport. The interruption of a beeper signal to remind athletes to stop and fill out a questionnaire was obviously problematic. For an athlete, while engaged in a sporting activity, to break concentration from the task at hand would potentially disrupt a flow experience, or if not in flow at least impeded the sporting performance (Jackson & Wrigley, 2004). For this reason Jackson and Marsh (1996) later developed the retrospective self-report measure of flow, the Flow State Scale (FSS).

Based on flow theory and Jackson's (1992, 1995, 1996) early qualitative method of assessing flow via in-depth interviews of athletes flow descriptions, the quantitative self-report FSS was designed to be administered immediately after a sporting or physical event. The FSS was to be later revised by Jackson and Eklund (2002) and adapted (Jackson & Eklund, 2004) to

capture the frequency in which a person would experience elements of flow on a dispositional or trait level.

Valid Quantitative Measures of Dispositional and State Flow

Jackson and Eklund's (2002) 36-item Flow State Scale-2 (FSS-2) and the Dispositional Flow Scale-2 (DFS-2; Jackson & Eklund, 2004) have been used by a multitude of research (e.g., Aherne et al., 2011; Briegel-Jones, Knowles, Eubank, Giannoulatos, & Elliot, 2013; Cathcart et al., 2014; Connolly & Tenenbaum, 2010; Kaufman et al., 2009; Kawabata & Mallett, 2011; Kee & Wang, 2008; Moore, 2013; Schwanhausser, 2009) to reliably enable the examination of athletes flow state experiences and a general propensity to experience flow in sporting and physical events. The dispositional and flow state measures enable researchers to compare responses on both levels to the same activity if required given the similarity in structure. The main difference between the items on the FSS-2 and the DFS-2 is the temporal focus of each item. For example, the FSS-2 is designed to assess flow during a specific single event that has just been completed. Hence instructions on the FSS-2 are worded in the past tense. For example, on the dimension of challenge-skill balance respondents are asked indicate – on a 5-point Likert scale ranging in response from 1 (*strongly disagree*) to 5 (*strongly agree*) – the level to which they agree to the question: "The challenge and my skills were at an equally high level." The 39-item FSS-2 is comprised of nine separate flow dimensions, with each subscale containing four items. The scale is designed to be completed no later than one hour after the just completed activity to promote clear recall of the experience (Jackson & Eklund, 2004).

As a dispositional measure, the DFS-2 scale is designed to measure the individual differences in the tendency of how frequently a person typically experiences the occurrence of flow in a chosen sport or a physical activity. The scale items are worded in the present tense. For

example, on the dimension of challenge-skill balance, respondents are asked: "I am challenged, but I believe my skills will allow me to meet the challenge." As there is no set time period specified for respondents to recall his or her experiences, researchers may adapt the questionnaire to a chosen timeframe that best suits the research question (Jackson & Eklund, 2004). Like the FSS-2, the DFS-2 is comprised of nine separate flow dimensions with each subscale containing 4-items that are assessed on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*always*) with higher scores indicating greater frequency of flow. The premise for using this scale in research is based on the notion that people who report more frequent occurrence of flow characteristics may be more predisposed to experience flow. The DFS-2 was also designed to tap into Csikszentmihalyi's (1975) conceptualisation of the autotelic personality. Again, from a dispositional perspective, the scale developers envisioned that responses to this scale may remain fairly stable over time; however, Jackson and Eklund (2004) urge research to investigate the temporal stability of the DFS-2.

Changes in Dispositional Flow

It may be reasonable to argue that a trait or dispositional attitude towards the evaluation of experiential stimuli may be behaviourally habitual and enduring and, by definition, resistant to change. Notwithstanding, based on research evidence in various areas, it may be equally reasonable to postulate that dispositional change is possible in time periods such as an eight-week period. For example, research on mindfulness training – focused on attentional and emotional regulation skills – has been found to facilitate changes in habitual patterns of evaluation and reactivity over the course of eight weeks (Baer, 2003).

After participating in mindfulness intervention protocols, participants have reported significant reductions in levels of physical and mental suffering brought about by the effects of

chronic pain, stress, and anxiety disorders (Kabat-Zinn, 1982, 2009), depression and depressive relapse (Segal et al., 2002; Williams, Teasdale, Segal, & Kabat-Zinn, 2007), Generalised Anxiety Disorder, Post-Traumatic Stress Disorder (PTSD), Obsessive Compulsive Disorder (OCD; Cayoun, 2011), and positive changes to attentional and emotional regulation that promote enhanced well-being (Hayes & Smith, 2005; Hayes et al., 1999; Kabat-Zinn, 1982, 2009). Thus, it may reasonable to postulate that after intensive mindfulness training there may be changes in dispositional flow as a consequence of the enhanced attentional and emotional regulation skills gained through the mindfulness training.

Attention and Awareness Regulation as Facilitators of Flow

Flow theory suggests that any attempts to forcibly replicate or induce flow paradoxically results in a sabotaging or derailing of the experience (Jackson & Csikszentmihalyi, 1999). However, Csikszentmihalyi (1978) emphasises that at the core of the flow phenomenon is the vital processes of attention and awareness. That is, when in flow, an unusual intense level of concentrated attention is focused on a limited stimulus field. Under these conditions, an athlete possesses the ability to direct attention at will to channel his or her stream of consciousness awareness in such a way that provides control over what information he or she wishes to process. Csikszentmihalyi warns that conscious awareness of threat and adverse anxiety-producing experiences will also command the same level of concentrated attention as optimal states; the principal difference is that aversive experiences involve an involuntary focus of attention. Thus, from an attentional perspective, “the individual’s choice determines the quality of the experience” (Csikszentmihalyi, 1978, p. 343).

Anxiety and Self-conscious Focus of Attention

In the face of adversity or difficult challenges, people – depending on their propensity to

view it as threat or opportunity for action – may feel a host of emotions and sensations ranging from fear, anger, anxiety, and sadness to excitement and eagerness (Carver & Scheier, 2005). As mentioned previously, flow theory literature suggests that anxiety is the antithesis of flow (Csikszentmihalyi, 1990; Jackson, 1995; Jackson & Roberts, 1992; Jackson et al., 1998; Stein, Kimiecik, Daniels, & Jackson, 1995). For example, Csikszentmihalyi (1975, 1990) claims that anxiety disrupts concentration by invoking a negative self-consciousness focus. That is, when anxious, a person will tend to perceive challenges as exceeding his or her abilities. This process entails an attention shift that focuses on perceived self-inadequacies that further create a sense of self-consciousness that impedes motivation and confidence to engage with challenges (Nakamura & Csikszentmihalyi, 2005).

From the Latin word *anxius*, anxiety fundamentally means the conditions of agitation and distress (Brantley, 2007). In explaining the mechanisms connecting fear, panic, and anxiety, Brantley suggests that when feeling fear and anxiety together there is an intense unpleasant sense of dread and threat. When threat is identified, a sense of fear can be defined by the feelings of agitation and trepidation. In intense situations, fear may develop into a sense of terror when threat and danger are perceived to be imminent. Moreover, the combination anxious physical sensations — linked to a sense of fear without the identification of danger — and narratives of the mind which are driven by implicational interpretation of anxiety may manifest as worry. Therefore, worry can be viewed as “the mind’s expression of anxiety” (Brantley, 2007, p. 15).

In competitive sport there are a multitude of personal and situational antecedents that may induce the aversive state of performance anxiety. Some of these include self-judgemental evaluations pertaining to the perceived importance of the competition, a predisposition for trait anxiety, maladaptive levels of perfectionism (due to an over-concern for making mistakes), the

perception that others have certain expectation of the athlete, fear of failure, and pessimistic attributions pertaining to low competence (Moran, 2012).

Anxiety from a general definitional perspective is a behavioural reaction by an individual to a perceived stressful situation (Spielberger, 1972). Commonly split into cognitive and somatic components, pre-competitive anxiety is linked to low frequency of flow states in sport (Jackson & Csikszentmihalyi, 1999). Cognitive anxiety relates to the manifestation of negative expectations and cognitive concern over performance outcomes which include perceived consequences of failure which may manifest as a fear of failure over time. Moreover, cognitive anxiety entails the use of negative self-evaluation and an over-concern with one's ability relative to others which is linked to a disruption in attention focus (Gardner & Moore, 2004). Somatic anxiety relates to the perception of unpleasant body sensations that emanate from increased autonomic arousal and unsettled feelings such as rapid heart rate, nervousness (e.g., butterflies in the stomach), and body tension (Kais & Raudsepp, 2005). Yet it is suggested that it is the cognitive rather than the somatic element of anxiety that yields the more detrimental negative relationship with that of flow (Csikszentmihalyi, 1990; Jackson, 1995; Jackson & Roberts, 1992; Jackson et al., 1998; Stein et al., 1995). The cognitive over-appraisal of somatic sensations may be related to the perception of anxiety and combine to impede flow (Jackson & Wrigley, 2004). This view is consistent with Cayoun (2011) who suggests that arising thoughts and sensations co-emerge in response to judgemental evaluation of stimuli.

Another consequence of performance anxiety is the phenomenon of choking under pressure. An athlete has said to have *choked* when he or she has performed more poorly than expected given his or her normal performance, skill level, and past achievements when faced with an acute stressor such as a high perceived pressure to perform (Beilock & Gray, 2007;

Worthy, Markman, & Maddox, 2009). The choking phenomenon is believed to occur across many diverse task domains where the incentive for optimal performance is at a maximum (Beilock & Carr, 2001). Explanations for choking include the factors of trait anxiety and self-conscious evaluation and attention focus. For example, an athlete may experience ego orientated thoughts and feelings that are personally directed inward as a result of the judgemental self-perception that the athlete is the target of public observation or a "a social object" (Fenigstein, Scheier, & Buss, 1975, p. 525). A propensity to experience high anxiety in performance situations where a perceived imposing challenge induces private self-conscious thoughts, such as those related to the consequence of failure and somatic sensations emanating from this anxiety, a co-emergence effect (e.g., Cayoun, 2011) forms to inhibit the vital concentration processes needed to remain absorbed in the task at hand (Beilock & Gray, 2007; Wang, Marchant, Morris, & Gibbs, 2004). In analysing this process from a competitive cycling perspective, based on prior high achievement and ability an elite cyclist may feel an extreme weight of expectation – brought about by self and perceived others' expectations – for winning a gold medal in front of spectators. This aspect of self-conscious focus is consistent with flow literature. For example, Jackson (2000) suggests there is no room for the questioning ego in a flow state as it impedes focused attention and absorption on the task at hand.

Pessimistic Attribution Style: Relationship between Self-judgemental Reactive Behaviour, Competence, Autonomy and Motivation

Self-conscious awareness and judgemental thoughts about the self are related to the concept of pessimism and optimism. A general definition is that optimists expect good outcomes while pessimists expect bad outcomes for themselves. Optimists and pessimists tend to differ in how they approach and cope with challenging or adverse situations. For example, optimists have

a tendency to accept the reality of a stressful or a highly challenging situation and confidently approach challenges and adverse situations by actively applying problem-focused coping skills to extract the best outcome possible from these situations. In contrast, pessimists tend to experience a crippling sense of self-doubt; hence they tend to avoid, deny, or lessen their awareness of perceived threatening situations (Carver & Scheier, 2005). When besieged by doubt, the mind is crippled through a process of an inability to focus on anything else than the thoughts associated with arising fear of failure and resistance to the experience (Brantley, 2007).

In terms of explaining failure feedback in relation to a demanding (anxiety inducing) competitive sport situation, it has been demonstrated that a pessimistic attribution style, which involves a process of self-deprecation, impedes optimal sport performance and experience (Seligman, Nolen-Hoeksema, Thornton, & Thornton, 1990). In relation to flow, a misdirection of attention due to pessimistic attributions is postulated by the current research to be a factor that obstructs the experience of flow. It may be that when attention is monopolised by self-judgemental evaluations which involve perceptions of low self-confidence and ability in the face of a demanding challenge, a resulting sense of a lack of control over the situation may trigger a response of passivity and a decrease in motivation for the current and future similar challenges (Seligman et al., 1990).

Although acknowledging the importance of attribution theories proposed by Heider (1944, 1958), Rotter (1966), and Weiner (1974, 1979, 1985, 1986), the current project specifically focused on the three causal dimensions underpinning the reformulation of learned helplessness theory (Abramson, Seligman, & Teasdale, 1978). These are the pervasiveness (specific/universal), permanence (permanent/temporary), and personalisation (internal/external) of causal beliefs pertaining to success and failure feedback.

People who are optimistic in the face of adversity or experiencing difficult situations expect a positive outcome. This type of intrinsic confidence yields a mix of positive feelings. Pessimists on the other hand expect negative outcomes. This type of self-doubt in abilities may result in a greater tendency to experience negative feelings such as anxiety, anger, despair, guilt, and sadness (Carver & Scheier, 2005). In the context of sport, a pessimistic or optimistic attribution style (AS; or explanatory style) is defined as the habitual belief process that a person may employ to explain or attribute the cause of successful or disappointing performances (Seligman et al., 1990). People who habitually explain bad events or defeat in terms of permanency ("it's going to last forever"), universality ("it's going to undermine everything I do"), and due to internal causes ("it's me"), and good events by temporary (transient), specific, and external causes exemplify a pessimistic attribution style. Conversely, optimists attribute adversity to transitory setbacks, a specific situation, and external factors for which they are not responsible and good events are seen as permanent, universal, and brought about by their own personal efforts (Seligman, 1992).

An individual's attributed cause for a given outcome is primarily focused on an in-depth search for the causal root for the situation. Unexpected adverse outcomes are likely to elicit a more detailed cognitive search and judgemental evaluation (Rees, Ingledew, & Hardy, 2005; Seligman, 1992). For example, in an experiment that added a spurious 1.5 seconds to elite varsity swimmers' lap times, Seligman et al. (1990) found that when presented with the unexpected slower lap-times the optimistic swimmers tended to process the feedback adaptively. Additionally, the optimists tended to persist with training to go in later time trials to maintain or better their previous "real" lap-times. In contrast, varsity swimmers with a pessimistic attribution style, who processed and fused perceived negative feedback with deficits in personal

ability, subsequently tended to show a reduction in effort to produce worse than expected lap-times. These results prompted Seligman et al. to suggest that optimistic swimmers tended to attribute the less than desired outcomes to temporary, specific, and external causes, which putatively yielded fewer sports-performance anxieties. In contrast, Seligman et al. suggested pessimistic swimmers attributed the adverse outcome to permanent, pervasive, and intrinsic causes that seemed to provoke self-focused beliefs that produced anxiety and self-doubt.

Several additional studies have examined the effects of attribution/explanatory styles in relation to sports performance (e.g., Gordon, 2008; Martin-Krumm, Sarrazin, Peterson, & Famose, 2003) and physical education performance (Martin-Krumm, Sarrazin, & Peterson, 2005), and these studies have reported similar findings to those of the Seligman et al. (1990).

To emphasise specific attributional evaluations that relate to the current investigation's focus on cycling, a cyclist with a propensity for evaluating feedback non-self compassionately, self-judgementally, and reactively to unexpected failure feedback may go through an in-depth causal search that prolongs the focus of attention on maladaptive ruminative thoughts that may further target personal deficits. Further, this maladaptive attention process may also be prolonged through the influence of the judgement of past experience and future expectation (e.g., Brantley, 2007; Cayoun, 2011). This judgemental attentional process may lower self-confidence (perceived self-doubt and a feeling of low competence) and reduce perseverance and motivation for the present challenge and for similar future challenges (Le Foll, Rascle, & Higgins, 2006, 2008; Seligman et al., 1990).

Thus it may be that a lack of confidence in ability (low competence and autonomy), persistence along with low motivation (amotivation) impedes flow (e.g., Kowal & Fortier, 1999). A pessimistic attribution pattern may impede the realistic matching of perceived high challenges

and skills, unambiguous feedback, and the facilitation of clear goals (Jackson et al., 1998). The sequential nature of components of flow (Kawabata & Mallett, 2011) suggests that a low perceived ability in skill would impact inversely upon clear goals because goals are meaningless without skill (Hunter & Csikszentmihalyi, 2000).

Moreover, Hunter and Csikszentmihalyi (2000) contend that it is the ability to concentrate on task-relevant stimuli that holds the flow experience together. Thus, if an athlete's attention is focused on feedback centred on maladaptive self-judgemental thoughts and sensations, then the feedback needed to optimally guide performance will be inhibited. Consistent with this rationale, research by Kowal and Fortier (1999) found that amotivation – which the authors argue parallels that of Abramson et al.'s (1978) concept of learned helplessness – was related to less flow while positive relationships were found between situational self-determined forms of motivation and perceptions of autonomy, confidence, and relatedness to higher incidence of flow.

Attentional Regulation Strategies in Sport

Paradox of control. The cognitive strategy of avoiding anxiety-laden thoughts has been postulated to be a factor that may facilitate flow. Jackson's (1992, 1995) qualitative work on factors possibly disrupting or preventing flow in elite athletes revealed that the athletes who avoided thoughts which disrupted their concentration or led to anxiety displayed a greater ability to attain flow relative to athletes who could not prevent the thoughts . However, traditional control and change-based cognitive behavioural strategies may not be as beneficial to sport performance as previously assumed by sport psychologists.

Growing research on the efficacy of traditional sport psychology treatments suggests that traditional avoidance strategies (i.e., of thoughts) may promote cognitive interference (Gardner

& Moore, 2006; Wells, 2005). Thus, by trying to actively suppress unwanted thoughts, the athlete may ironically enter into a paradox whereby the control strategy triggers a cognitive process which searches for the unwanted thoughts and sensations and also brings them into awareness, thus ironically increasing the frequency and saliency of the thought or sensation that was originally attempted to be avoided or escaped (Gardner & Moore, 2006; Siegel et al., 2009; Thompson, Kaufman, De Petrillo, Glass, & Arnkoff, 2011). This *ironic mental control process* (Wegner, 1994) is of particular relevance to the experience of flow because this process is postulated to focus attention and awareness on the self and other task irrelevant stimuli that may disrupt a present moment, non-self-conscious narrow attention focus relating to lessened absorption in the present moment goal-related task which is a vital characteristic of flow state experiences (e.g., Gardner & Moore, 2004; Kaufman et al., 2009).

Gardner and Moore (2004) suggest that mindfulness-acceptance-based programs offer an efficacious alternative to traditional control and change-based approaches. The development of attentional awareness and an accepting acknowledgement of present moment internal and external stimuli promote a willingness to remain engaged in a task. Gardner and Moore suggest that there are similarities between the achievement of a mindful-accepting attitude that entails a non-judgemental, non-self-conscious attentional focus on a specific present moment task at hand and the experience of flow. Aherne et al. (2011) suggest that mindfulness-based intervention training can improve concentration by inhibiting judgemental processes to promote flow and successful sports performance.

For the pessimist, attributions that are judgementally confirmed reinforce pessimism. A repeated negative reinforcing response of trying to escape or avoid detected aversive stimuli may, over time or from one trial learning (Langer, 2005), lead to a lack of persistence or a

reduction of effort or perhaps quitting or giving up on a sport task altogether in an attempt to disengage from unpleasant thoughts and sensations (Gardner & Moore, 2004).

Hunter and Csikszentmihalyi (2000, p. 12) state that "when clearly defined, the goal defines the mission to be accomplished and frees up attention to concentrate on the moment without having to worry about the next one". Hence without clarity of intent, "action becomes diffused and aimless" (p. 12). Thus by defining clear goals in advance and adjusting appropriately through clear, non-elaborative, and immediate feedback presented by the task demands, a mindful athlete can be informed of which internal (kinaesthetic awareness) and external (uncontrollable environmental and situational events) stimuli should be attended to and to which can be disregarded, thus ensuring that attention is directed towards task-relevant cues only (Jackson & Csikszentmihalyi, 1999).

Thus, an athlete, ideally, is mindfully aware of the available kinaesthetic and environmental feedback as a source of information regarding his or her progress in relation to proximal goals. The adaptive use of feedback helps direct appropriate action and enables proximal goal adjustments, be it a small correction or a major change, to help sustain a progressive moment-by-moment optimal attention focus for the task at hand. When attention is turned to reading body sensations to guide the athlete through space, it is vital that judgements of status are made without attention turning to an emotional self-conscious evaluation (Jackson & Csikszentmihalyi, 1999) that are fused with self-deprecating thoughts such as, "I am feeling pain all through my legs…I am not going to finish, I better stop…but if I stop others will think I am useless". For feedback to be productive, an athlete needs to process this information in an observational and accepting framework, without using a self-judgemental (cognitive fused process of over-appraisal) process which oftentimes leads to a misattribution or over-evaluation

process where implicational information is manufactured in the absence of factual information (Cayoun, 2011).

Attention Strategies for Coping with Exertion Strain and Pain

To perform at an optimal level, especially in endurance events, a cyclist must repeatedly generate effort from sub-maximal to maximal levels of exertion. When an intense physical effort is exerted for an extended period of time, a cyclist will inevitably experience exertion pain, stress, and discomfort. Yet surprisingly, in the elite domain of competitive cycling the cognitive coping strategy of attending to or associating with internal body sensations such as exertion pain is a dominant attention strategy as opposed to the strategy of attempting to ignore or dissociate from the pain (Kress & Statler, 2006). Similarly, varsity rowers, using a mix of internal and external associative attention strategies, have been found to perform significantly better than those rowers using a dissociative strategy (Connolly & Janelle, 2003). This effect has also been reported for faster running times (Mallett & Hanrahan, 1997) and swimming (Couture et al., 1999).

Baghurst, Thierry, and Holder's (2004) findings suggest that performance may be best enhanced by a cognitive attention style that correlates with an athlete's personal attentional strengths. These findings from the Baghurst et al. study should be viewed in light of the fact that the athlete sample assessed in these authors' research differed in levels of athleticism (i.e., non-elite) from those athletes assessed in previous studies (i.e., elite), suggesting that some factors (i.e., lower level of experience and ability) may have not provided the athletes with skills that enable an associative preference as reported in other studies.

These findings pertaining to the difference between elite and non-elite athletes' attention preferences relates to the seminal work by Morgan and Pollock (1977) who found that elite

marathon runners preferred to adopt an associative focus of attention (i.e., paying attention to body signals) as opposed to a dissociative focus (i.e., focusing on other stimuli in an attempt to distract attention away from somatic discomfort) which was associated with faster running times compared to non-elite runners who generally adopted a dissociative focus of attention. It was expected that the elite runners would be significantly faster that the non-elite runners due to differences in ability and experience. However, of interest to these authors was the difference in their cognitive activity when competing which prompted an emergent theory of a "perceptostat [sic]" (p. 401), which describes an integrated sensory and experiential information thermostat that is used to modulate perceptual effort.

Morgan and Pollock (1977) proposed that the elite runners who tended to associate with internal sensations, such as the pain felt from the onset of lactic acid build up and muscle strain, attempted to process this information adaptively (i.e., not placing much attentional emphasis on "pain zones" or "the wall") which enabled them to modulate their pace accordingly to resourcefully allocate appropriate energy in a steady state effort to achieve the clear goal of performing optimally (p. 400). In contrast, the non-elite runners who tended to use the cognitive coping strategy of dissociating or distracting their attention away from body sensations were prone to a cycle of turning attention back towards internal alerting cues and then, after adjusting their pace to repay the deficit, returned to a dissociative focus of attention. This "off-on-off attention approach" used by the inexperienced runners resulted in a net process of "insufficient utilization of fuel" which suggested that these athletes would "eventually come up against the wall" to at best perform under potential capability, or at worst, cease engaging in the activity (Morgan & Pollack, 1977, p. 401).

Masters and Lambert (1989) argue that an athlete's preference for an associative or a dissociative cognitive coping style has little to do with avoiding pain; it has more to do with the athlete's choice pertaining to motivation. However, McCaul and Malott (1984) suggest that the level of discomfort dictates attention choice in relation to pain. These authors argue that dissociative (distraction) strategies are only effective in reducing distress when pain is judged to be mild as opposed to when it reaches an intense level. This later theory is congruent with what Morgan and Pollock (1977) posit. That is, an athlete prone to a dissociative coping style will inevitably be forced to associate with sensory discomfort when it reaches an alarming (salient) level. In regards to the McCaul and Malott (1984) research, what is of interest to the current examination into the effects of mindfulness on flow is McCaul and Malott's use of the term of "redefinitional" (re-interpretation of stimulus) associative strategies.

McCaul and Malott (1984) theorised that under the redefinitional context of attention, an associative focus strategy would be used due to the effect of perceived intense pain invasively entering awareness. Thus under this high intensity, a dissociative focus will not be effective. However, attending to the stimulus with an attitude of redefinition, objective information coding inhibits an emotionally distressing judgement of evaluation of the intense sensory input, thus reactivity (anxiety, fear) is reduced and the perception of discomfort is minimised via a process not dissimilar to desensitisation.

If concentrated attention is lost or wanders for even a small moment in time from the specific task at hand, performance may decline and optimal experience will be disrupted. The work of Morgan and Pollock (1977) seems to support this proposition. Morgan and Pollock found that skilled marathon runners tended to use an internal attention processes (i.e., associative strategies) which promoted faster running times and greater acceptance of discomfort. This

process contrasted to that of less skilled runners who tended to employ externalising strategies (i.e., dissociative style) to avoid the discomfort and pain associated with of sub-maximal or maximal levels of exertion while competing. It may be that what Morgan and Pollock had been examining was an athlete's natural ability to use attitudes that align with either being mindful (associative) or mindless (dissociative). Consistent with this speculation, Birrer, Röthlin, and Morgan (2012) suggest successful athletes seem to use attitudes that align with mindfulness philosophies that promote a present moment focus, acceptance of unpleasant events such as physical pain, along with practicing consistently.

Thus when elite endurance athletes habitually engage with a task within a mindless state, it may be that a dissociative focus of attention will be used to cope with pain and anxiety, to detrimental effect. In a study by Kress and Statler (2006), the following qualitative statement made by one former Olympic road cyclist provides support for this claim. Consistent with dissociative cognitive strategies for coping with exertion pain and perceived anxiety pertaining to the cognitive evaluation of intense discomfort being associated with sub-maximal levels of exertion, the former Olympian states:

> Thinking about your girlfriend or laying next to the river watching the water flow or some other nice thing, that's nice for a while. It takes away from the pain. All of a sudden, your speed drops five miles per hour or something. You have got to concentrate on what you are doing, but at the same time, you don't want to concentrate on the pain either because that will back you off too, you have to be very aware of what you are doing. (Kress & Statler, 2006, p. 439)

The values of a Western ethos of competitive cycling where an attentional strategy of avoiding troubling sensations and co-emerging thoughts is oftentimes used to strive towards

attaining an outcome and a traditional Eastern mindfulness perspective of acceptance and non-striving with no deliberate outcome goal seem, at face value, paradoxical. However, by examining Noble and Robertson's (1996) definition of perceived exertion as "the act of detecting and interpreting sensations arising from the body during physical exercise" (p. 4), we can integrate these attitudes by focusing on the mindfulness concepts of acceptance and equanimity. By observing naturally arising thoughts and sensations that emanate from physical exertion and fatigue through the modified attitude of open acceptance, non-self-judgement, non-implication, and no reactivity, pain and discomfort become a valuable unambiguous feedback resource to help inform the athlete of how to adaptively repay the deficit to optimally manage present moment effort towards the proximal goal.

The Impediment of Flow through Maladaptive Attention Focus

In flow people oftentimes report feeling sensations pertaining to the movement and perceived exertion as effortless or out of awareness. However, as Jackson (1996) discusses, sometimes athletes need to be aware of effort and exertion and in some instances athletes see this as part of the enjoyment of the flow experience. Jackson suggests that the word *effortless* may be misleading, what in actual effect may be occurring is the absence of perceived feelings of strain, pain and tension. Consistent with this view is the proposition by Salmom, Hanneman, and Harwood (2010) who argued that the whole school of thought pertaining to associative and dissociative attention styles has outlived its usefulness. Consistent with the proposed adaptive mechanisms of mindfulness, these authors argue that as an alternative, a mindful moment-by-moment focus of attention will impact productively on the pursuit of enhanced athletic performance.

Chapter 3

Literature Review on Mindfulness

Conceptualising Mindfulness

In relation to present moment-by-moment human experience, attention and awareness may be considered to be intertwined forms of consciousness. The ability to mindfully focus attention on an intended stimulus is contingent on the continuous background awareness of one's environment and personal thoughts and feelings. Mindfulness may enhance attention and awareness for what is taking place in the present moment (Brown & Ryan, 2003). For this reason mindfulness is "a unique quality of consciousness" (Brown, Ryan, & Creswell, 2007b, p. 272).

The term mindfulness is an English translation for the Pali word, *sati* (Pali is the language in which the original teachings of Buddha were recorded), which quite literally means *to remember* (Brown, Ryan, & Creswell, 2007a; Siegel, Germer, & Olendzki, 2009). Siegel et al. (2009) note that within the ancient meaning of mindfulness remembering relates not to memories of past experiences or events; it relates to the intention of paying close attention to present moment experiences or, in essence, the skill of remembering to be aware. Moreover, as a mode of consciousness, mindfulness it is said to denote a presence of mind (Brown et al., 2007a).

Derived from Buddhist tradition, the ancient contextual purpose of mindfulness is to reduce needless suffering via the cultivation of observation, wisdom, and insight, both for the inner workings of the mind and the true nature of the material world (Siegel et al., 2009). Expanding beyond the ancient roots of mindfulness, Western therapeutic practices (e.g., Mindfulness -integrated Cognitive Behavioural Therapy [MiCBT], Cayoun, 2011; mindfulness-based stress reduction [MBSR], Kabat-Zinn, 1982; 2009; mindfulness-based cognitive Therapy [MBCT], Segal, Williams, & Teasdale, 2002; acceptance and commitment therapy [ACT],

Hayes, Strosahl, & Willson, 1999; dialectical behavior Therapy [DBT], Lineham, 1993a, b) have conceptually expanded upon the original concept of *sati* (awareness, attention, and remembering) by including mental qualities such as acceptance, non-judgement, non-reaction, and compassion (Siegel et al., 2009).

In Western therapeutic literature, mindfulness is commonly defined as "an openhearted, moment-to-moment non-judgmental awareness" (Kabat-Zinn, 2005, p. 24). An awareness that is intentional, accepting, and curious of the constant stream of incoming thought and sensation (Bishop et al., 2004). When mindful, a person is in a flexible, open, and novel state of mind that is sensitive to context and perspective of present moment experience (Langer, 2005). Phrased another way, mindfulness most notably appears to be absent when an individual's attention is captured by rumination and fantasy (Brown & Ryan, 2003). Often this occurs because the mind has a strong tendency to wander, dissociating from the present moment task or becoming preoccupied or fused with the content of thought and emotion (Kabat-Zinn, 1982). This habit of dissociating from the present moment leads to a pervasive lack of awareness. It may be that a lack of awareness and understanding of our mind and how it influences our perceptions and actions limits our perspective on the human condition (Kabat-Zinn, 1994). Langer (2005) notes that when perceiving the world mindlessly a person is trapped by a rigid cognitive process that is oblivious to context or perspective. Therefore behaviour is governed, rather than guided, by routine and rules.

Within Western clinical populations, over the last decade mindfulness-based intervention therapies have become a popular alternative to traditional "second wave" cognitive-behavioural techniques. The defining principles differentiating this new "third wave" mindful-acceptance cognitive behavioural therapy and traditional behavioural approaches is that mindfulness, or

acceptance-based behavioural therapy (ABBT), seeks not to eliminate, control, reduce, or avoid maladaptive cognitions and emotions (which is often an object of second wave cognitive-behavioural therapy), but accepting openheartedly and non-judgementally through training that arising internal cognitions, feelings, and sensations are just mental events that come and go in a transient manner (Gardner & Moore, 2010). Thus, clients are encouraged not to evaluate situations as good or bad, true or false, healthy or sick, or important or trivial (Marlatt & Kristeller, 1999).

In the Buddhist approach, the traditional treatment for unhappiness, disappointment, and frustration was the awareness and knowledge that patterns of human conditioning continually influence consciousness. Through direct insight into the nature of human experience, mindfulness practitioners learn to become aware of learned behaviours and conditioned responses that are built on cognitive interpretations. The perception of taking what is impermanent and transient – subject to change – as stable, pervasive, and fused with a sense of self, deludes and erroneously results in the belief that we can hold on to what we desire and rid ourselves of what we do not want (Siegel et al., 2009). From a traditional Buddhist perspective, Siegel et al. note, ironically what we resist will persist and what we desire will ultimately strengthen the foundation of suffering. These authors suggest "the solution is to practice letting go of desire itself, which can be replaced by an attitude of equanimity or acceptance" (p. 32). In linking the core concepts of mindfulness to the conscious experience of flow, the notion of letting go of desire is consistent with theory that suggests that attempts to forcibly replicate or induce a desired flow state paradoxically results in a sabotaging or derailing of the experience (Jackson & Csikszentmihalyi, 1999).

Mindfulness Training

Increasing evidence suggests mindful-acceptance-based clinical interventions are effective in treating a host of clinical disorders such as depression and anxiety in addition to enhancing general well-being (e.g., Roemer & Orsillo, 2010), as well as attention and emotional regulation (Cayoun, 2011). However, Teasdale, Segal, and Williams (2003) claim caution should be taken in relation to the generic use of mindfulness-based interventions as a panacea for a broad range clinical and non-clinical application. Teasdale et al. suggest an appropriate formulation of mindfulness training that addresses the specific factors that maintain problematic behaviours be used.

Therapeutic Benefits of Mindfulness Training

Brown and Ryan (2003) suggest mindfulness plays an important role in fostering self-enforced behaviour regulation which may be associated with enhanced well-being. That is, mindfulness facilitates disengagement of automatic habitual thought patterns and reactive behaviours. The ability to remain mindfully attentive and aware of the continual stream of thoughts and sensations is contingent on a non-judgemental attitude and non-reactive self-regulation of overt and covert behaviour. Generally the automatic human behavioural response to arising stimuli is discriminative by nature. This primary rapid appraisal is judgemental in that objects and mental events are often quickly viewed as good, bad or neutral. Consequently cognitive schemas, beliefs, and attitudes are shaped over time into habitual behavioural responses that are channelled into automatic perceptions when encountering similar (often perceived as the same) events in the future (Brown et al., 2007a; Cayoun, 2011).

Brown et al. (2007a) note that this automatic processing of information (doing mode) results in a distorted picture of reality in that sensory objects and events are rarely seen as they

truly are due to the filter of "self-centred thought and prior conditioning" (p. 212). Whereas a mindful mode (being mode) of processing entails the bare recording of facts observed due to a non-judgemental and non-reactive attitude which buffers against the cognitive influence of subjective distortion or embellishment of thought.

Rumination

Mindfulness-based clinical interventions often focus on relieving the debilitating effects of anxiety, depression, and the ruminative thought process that maintain these conditions. Rumination is a style of repeated cognitive analysis of negative recurrent thought that focuses on the cause, consequence, and implications of a perceived negative event (Nolen-Hoeksema, 2000). In relation to pessimistic attribution style, rumination can be argued to be a central factor in maintaining the behaviour of a causal search that focuses on self-deprecating thoughts. This may occur because ruminative patterns of thought include a persistent dwelling on personal issues and inadequacies and a constant analysis of what has gone wrong and why (Baer, 2007). Much like the cognitive analysis involved in attributional styles of thinking, an analysis of individuals who engage in ruminative thinking indicates that they believe that by focusing on shortcomings and causes of negative events they will be able to gain important insight into how to improve moods and outcomes in the future. However, empirical data suggests otherwise. For example, Nolen-Hoeksema (1991) argues that ruminative patterns of negative thinking actually serve to prolong depressive moods. Mindfulness-based cognitive therapy (MCBT) is based on the rationale that rumination is a major contributing factor to the maintenance of depression and depressive relapse (Segal et al., 2002; Williams et al., 2007). Reduction of rumination may be important in reducing depression and a reduction in experiential avoidant behaviour may also be important in reducing the effects of anxiety-based behaviours and disorders (Baer, 2007).

Mindfulness is underpinned by multiple facets or components. For example, complementary to attention and awareness is the concept of acceptance. Acceptance refers to the act of recognising one's own thoughts, emotions, and sensations as they are and as they arise and then subside – as being transient and impermanent in nature – and accepting that trying to avoid, escape, or change them is unhelpful. Sometimes mistaken for a passive response or a resignation to experience, acceptance is actually a cultivation of openness and compassion for observed present moment experience. Free of judgement, evaluation, and the compulsion of control, an accepting stance releases the observer from a narrow bounded attention focus (Roemer & Orsillo, 2010).

It may be that all traditional mindfulness-based practices include some kind of meditation because as a basic human capacity, mindfulness can be facilitated by the practice of meditation (Brown et al., 2007a; Kabat-Zinn, 2003). The Western expression *mindfulness meditation* is derived from the Pali words *vipassana bhavana*, to which the common English translation is the "cultivation of insight" or "insight meditation" (Siegel et al., 2009, p. 27). Siegel et al. suggest mindfulness meditation involves bottom-up rather than top-down processing of the constant stream of sensory information that enters awareness via thoughts, cognitive images, sounds, smells, tastes, and body sensations. Bottom up processing – from the perspective of a non-judgemental observation of raw stimuli – in effect steers attention away from a focus on forming cognitive narratives, schemas, beliefs, and the conceptual elaboration of perceived stimuli, thus denying the mind of much of the energy that fuels anxiety, rumination, and the formation of negative self-concepts.

Mindfulness Meditation

Lutz, Slagter, Dunne, and Davidson (2008) proposed a theoretical framework of

meditation based on Buddhist contemplation techniques that extend to adaptations by Western clinical interventions. Lutz et al. suggest two broad categories: focused attention (FA) and open monitoring (OM) meditation, which are often eventually combined depending on the nature of traditional (e.g., Zen, Vipassana, and Tibetan Buddhism) and secular intervention training (e.g., MiCBT, MBSR; MBCT) that draw on traditional Buddhist meditations. Together, FA and OM meditations entail developing the ability to focus attention and remain attentive to an intended object in an open monitoring mode of conscious awareness. Within this mode of present moment focus, the skills of detecting distractions, disengaging attention from the source of the distraction, and redirecting and engaging attention back to the intended task are developed. With sustained practice, a form of "effortless concentration" on a narrow field of focus may be attained (Lutz et al., 2008).

Consistent with the current thesis proposal that mindfulness-meditative processes will facilitate the enhancement of mindfulness to promote flow conditions that will enable increased frequency of flow state experiences, Lutz et al. (2008) suggest that with increased experience FA meditation may eventually induce trait changes in attention focus and emotional regulation. That is, as advanced levels of FA are achieved, attention eventually rests more voluntarily, sustainably, effortlessly, and narrowly on a chosen focus. Increases in FA processes may also correlate significantly with decreases in emotional reactivity. Yet while FA and OM are commonly integrated, what distinguishes OM from FA is that within an OM process there is no strong distinction between selection and deselection of attention focus as is in FA practice. Lutz et al. argue that as FA skills are advanced, well-developed monitoring skills become the main point of transition into OM meditation practice.

The aim of OM thus is to remain attentive to moment-by-moment experience by allowing any stimulus that enters awareness to arise and then fade without focusing explicitly on any object or feature. Lutz et al. (2008) propose that initially in OM meditation, practitioners tend to "grasp" onto objects in a way that requires the FA skill of deliberate disengagement of focus. However, over time and with experience, OM practitioners can effortlessly detect the emotional tone of a stimulus – previously tied to the effortful selection of grasping onto an object in awareness – without attaching any explicit focus of attention on the object. That is, emotional tone moves into the background even in the absence of cognitive activity in the foreground. As a consequence of increased OM abilities, trait changes in "non-grasping" states are developed. Eventually practitioners of OM develop the ability to:

> …gain a clear reflexive awareness of the usual implicit features of one's mental life. It is said that awareness of such features enables one to more readily transform cognitive and emotional habits…and leads to a more acute but less emotionally reactive awareness of the autobiographical sense of identity that projects back into the past and forward into the future. (Lutz et al., 2008, p. 7)

As suggested by Lutz et al. (2008), the development of emotional and cognitive flexibility enables a non-grasping attitude which promotes an ability to effortlessly switch attention back to an intended focus. This point is consistent with Baer (2009) and Cayoun (2011) who suggest that with the increase in mindful meditation experience practitioners gain the capacity to voluntarily and rapidly shift attention focus (equanimously) as opposed to being drawn automatically to focusing on threatening and unwanted stimuli.

From a holistic perspective, FA and OM meditative practices – derived from traditional Buddhist concepts – may be effective in modifying pessimistic attributional processing of

disappointing performances, pre-competitive stressors, related cognitive and somatic anxieties, and increasing voluntary attention focus on the task at hand to facilitate flow conditions to promote the increase in frequency of flow state experiences.

Consistent with the mindful meditation training adopted by the MiCBT protocol (Cayoun, 2011), within the Burmese Vipassana tradition mindfulness meditation training teaches individuals to internalise attention in a way that promotes a deep level of experiential and interoceptive awareness and acceptance (Cayoun, 2011). Following the central mechanism inherent in other traditional OM mindfulness meditation practice is the conceptual focus placed on internal context of experience. One learns to be exposed to stimuli (pleasant or unpleasant) without judgement and without reaction. Simply, arising thoughts and sensations are observed objectively through an attitude of "equanimity". Equanimity, as defined in the current therapeutic context is "the conscious and deliberate act of being non-reactive towards an event experienced within the framework of one's body and thoughts as a result of non-judgmental observation" (Cayoun, 2011, p. 17), akin to the concept Kabat-Zinn (1982) calls *detached self-observation*. Cayoun (2011) notes that a conscious awareness of internal thought and somatic sensation are integral elements of equanimity. That is, without actual awareness of an internal experience, how can one be accepting of the experience?

Popular Western Orientated Mindfulness-based Intervention Programs

The Mindfulness-Based Stress Reduction (MBSR) program may be the most frequently used Western method of systematic mindfulness training. Originally developed by Kabat-Zinn (1982, 2009) as the Stress Reduction and Relaxation Program (SR & PR) — for the medical treatment of disorders ranging from chronic pain to stress-related issues — Kabat-Zinn (1982) found support for the efficacy of the approach in training chronic pain patients in the self-

regulation processes of detached observation via a 10-week mindfulness intervention. By uncoupling the somatic experience of pain from the affective evaluation, Kabat-Zinn found evidence for the effectiveness of mindfulness meditation practice to decrease human suffering both physically and mentally via the cognitive reappraisal process.

Although originally conceived as a 10-week program, generally the MBSR (Kabat-Zinn, 2009) program is conducted over an 8-week course. Groups of individuals – up to 30 participants – meet weekly for two to two and a half hours in sessions that cover instruction and practice of mindful meditation skill, discussion related to well-being that cover concepts such as stress and coping, and assigned homework. In week six of the program, participants are required to attend an all-day (7-8 hour) session over a weekend to practice formal meditation and interaction group discussion. Mindful meditations range from sitting meditation, body scan, and mindful hatha yoga. Interactive discussions focus on the challenges encountered and skills achieved while practicing mindfulness in daily life over the course of a potentially stressful week.

Frequent formal out of the class meditation practice is stressed as an important part of developing mindfulness skills. Recommended duration of meditation is at least 45 minutes per day for six days a week for seven weeks. To help with the out of class meditation practice, two CDs are provided which contain formal meditation instructions that are consistent with classroom directions. In the sitting meditation, practitioners are asked to find a quite comfortable place to sit with a relaxed wakeful posture and eyes closed. Practitioners are then directed to pay full attention to the sensation of their breath as a baseline focus while still allowing a focus of awareness of any bodily sensations, cognitions, sounds, and smells from the environment as they may arise. The 45-minute body scan exercise entails a sequential attention focus on body parts within a non-judgemental framework, noticing any sensation that may enter awareness. Mindful

hatha yoga is used to teach mindfulness of body sensations via yoga postures that promote genital movement and stretching. Additionally, generalisation of mindfulness skill is encouraged in everyday life activities such as mindful walking, standing, and eating. In these activities, as with formal meditations, when emotions, cognitions, and sensations arise practitioners are encouraged to observe them non-judgementally. When the mind is observed as wandering on to thoughts of past and future events, practitioners are encouraged to briefly note the content of the experience and then gently guide attention back to the present moment focus of the activity.

In clinical applications, the MBSR program has been found to increase mindfulness (as measured on the FFMQ) and well-being and decrease stress and related symptoms from pre- to post-MBSR (Carmody & Baer, 2008). Relevant to the current thesis is the utility of the MBSR program for elite sport. Phil Jackson, an American National Basketball Association (NBA) coach and MBSR advocate, trained the Chicago Bulls during their championship run between 1991 and 1993, followed by the Los Angeles Lakers' championship seasons from 2000 to 2002. Anecdotal evidence suggests mindfulness training contributed significantly to Jackson's team successes over these periods of time (Kabat-Zinn, 2009).

Mindfulness-Based Cognitive Therapy (MBCT; Segal et al., 2002) is an 8-week manualised group intervention program designed to prevent depression which is based chiefly on the mindful meditation practice of Kabat-Zinn's (2009) MBSR program. At the core of MBCT is the focus on cognitive rumination which is viewed as a major contributing factor to the maintenance of depression and depressive relapse (Segal et al., 2002; Williams et al., 2007). As the name suggests, the program incorporates elements of cognitive therapy that emphasises the view of detached or decentred stance towards one's thoughts, emotions, and sensations. A mindful non-judgemental attitude towards thoughts and feelings is a primary focus for skill for

development. Additionally, participants learn to understand and view all mental events as simply events that come and go, are transient in nature, and not a true reflection of the self or reality (Baer, 2003).

Described as an example of a cognitive behavioral therapy that integrates acceptance strategies that have been adapted from Zen philosophy, and coupled with client-centred genuineness (DiGiorgio, Glass, & Arnkoff, 2010; Linehan et al., 1999), Dialectical Behaviour Therapy (DBT; Linehan, 1993a, 1993b) is a year-long group intervention approach designed to treat borderline personality disorder. Over the year, clients meet weekly to develop skills such as emotional regulation, distress tolerance, and interpersonal effectiveness to enable them to change behaviours and environmental situations in order to build a better life (Linehan, 1993a, 1993b). Baer (2003) explains the basis of this therapeutic intervention program comes from the "dialectical world-view, which postulates that reality consists of opposing forces. The synthesis of these forces leads to a new reality, which in turn consists of opposing forces [central opposing forces being acceptance and change], in a continual process of change" (p. 127). To enable the modification of thoughts, emotions, and behaviours, DBT operates on a similar premise to MBSR in relation to mindfulness conceptualisations (Baer, 2003), and to mindful exposure to stimuli without emotional and cognitive judgment, or reaction (Linehan & Schmidt, 1995). In DBT, mindfulness skills are developed first through synthesising radical acceptance via skilful means (Linehan & Schmidt, 1995; Robins, Schmidt, & Linehan, 2004). Mindfulness skill acquisition is facilitated through both the practice of the therapist and through the mindful accepting skills taught to clients, which emphasise an attitude of full engagement and a clear observation of what is taking place in the present moment (Linehan & Schmidt, 1995; Robins et al., 2004). Grouped by *what* skills are the three mindfulness skills of observe, describe, and

participate. *How* skills are comprised of non-judgementally, one-mindfully (Linehan, 1993a, 1993b). Variations of Zen meditation (breathing meditations) are used to help develop these mindfulness skills, however, within the DBT structures a less standard approach to the duration and frequency of meditation training is recommended to that prescribed by Kabat-Zinn in the MBSR program, due to the nature of impairment for some clients that may render them unwilling or unable to practice routinely (Linehan, 1994).

Anchored by contemporary behavioural analysis and cognitive theory, Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) is a psychological intervention which is based on modern behavioural psychology which has the capacity to create psychological flexibility via processes linked to mindfulness, acceptance skills, committed behavioural change processes, and value-based living (Hayes et al., 2006; Hayes & Smith, 2005). ACT operationalises clinical treatment for a host of psychological disorders based on the philosophical principal of mindfulness. For example, in two core process, acceptance and being present, clients are taught to experience the world and their thoughts and sensations more directly and are encouraged to see these experiences as separate from the person having them. Additionally, clients are directed to observe these thoughts in a non-judgemental and accepting manner and not to try and avoid or change them, to let them be as they occur (Hayes et al., 2006). At the heart of ACT is a conceptually complex theory called Relational Frame Theory (RFT) which functions on the assumptions set by rule governance and the verbal rules which guide human behaviour (see Hayes et al., 1999 for a full operational definition). Basically, RFT operates on the premise that "[at] the core of human language and cognition is the ability to learn to relate events under arbitrary contextual control" (Hayes, 2004, p. 648). This RFT premise illuminates why cognitive fusion and experiential avoidance behaviours impede well-being.

Hayes (2004) points out that humans are adept at abstracting relationships between features and bringing them together under some kind of contextual control that normally would not relate formally. Humans do this on the basis of a relational learning process that is transferred to events and objects that are perceived to be related on the basis of seemingly arbitrary cues. Relational learning entails first drawing on a relationship between mutual entailment, "bidirectionality"(p. 648). Second, the relational learning process involves a combinational entailment. Third, the relations transform stimulus functions between the related stimuli.

In addition to RFT, ACT proposes six core treatment processes: acceptance, cognitive de-fusion, being present, self as context, values, and committed action. These therapeutic processes comprise a valuable positive psychological skill set (Hayes et al., 2006). The six core processes are designed to be coupled with the use of mindful exercises, metaphor, and experiential processes to highlight the functions and benefits of present moment awareness and acceptance of thoughts and sensations with the aim of melding these processes and exercises together to facilitate psychological flexibility (Hayes et al., 2006). Hayes and Smith (2005) suggest that what makes ACT an effective tool for the development of a mindful attitude within a contemporary fast-paced world is the use of the above mentioned processes that augment extensive training of traditional mindful meditation that developed in another, slower age.

It appears that what essentially separates ACT from the more traditional mindfulness-based protocols is its primary – contemporary – emphasis on the importance of human language and the contextual role it plays in shaping overt and covert human behaviour (Hayes et al., 1999). That is, "explicitly contextualistic" meaning (Hayes, 2004, p. 639) of human language is

changed from one strategy that promotes emotional control to one that facilitates acceptance of thoughts, sensations, and urges (Woods, Wetterneck, & Flessner, 2006).

The Mindfulness-integrated Cognitive Behaviour Therapy (MiCBT; Cayoun, 2011) eight-week manualised program is a systematic therapeutic approach that integrates mindfulness meditation with the core elements of cognitive behavioural principles. The aim of the program is to facilitate the skill of internalising attention to promote the regulation of emotions and attention which can then be applied to external events and circumstances that trigger or maintain impairment. The MiCBT model contains a flexible 4-stage delivery of mindfulness development that includes weekly class sessions that discuss mindfulness concepts and issues related to daily stressors and commitment to daily mindful meditation training and everyday mindful activities.

In stage 1, the *personal stage*, internalised attention is developed. Via mindfulness meditation training, internalised attention is channelled in a way that promotes deep levels of acceptance and experiential awareness. Within this process, clients learn about the internal context of experience that equips them with an increased sense of self-efficacy and self-control in relation to regulating emotions and attention focus that are tied to arising cognitions and sensations, prior to addressing everyday stressors (Cayoun, 2011).

The sitting meditations of mindfulness of breathing (MOB) and seated body scan used in stage one are consistent with those explained in the MBSR program. However, Cayoun (2011) emphasises that the body scanning meditations used in the MiCBT program form the core of learning emotional regulation principles. Cayoun uses the term “co-emergence” to explain that emotions are the manifestation of co-emerging thoughts and sensations. Body scanning is used to learn how to remain at ease with body sensations in order to minimise emotional reactivity during troubling events. Delivered in a hierarchical approach at weekly intervals (aided out of

class by two guided meditation CDs), the first body scan is the *unilateral* part-by-part scan. When clients reach proficiency in the unilateral scan they are moved to the *bilateral symmetrical* part-by-part scanning meditation. Following proficiency of the latter the client then moves to the *partial sweep* and then the *sweep en masse*. If clients master these meditations they then move to *transverse scanning* (see Cayoun, 2011 for a full description of each of these scanning exercises). Cayoun suggests that the more complex scanning methods enhance what he calls "interoception" (internal awareness of sensations) to allow rapid detection and mindful appraisal of even the most subtle of body sensation. The advantage of these may be the ability to detect very early distress cues that in effect will promote relapse prevention (i.e., not falling prey to old reactive behaviours).

Attention regulation is a key element of the personal stage. By practicing mindfulness meditation for 30 minutes twice daily (out of class sessions), Cayoun (2011) suggests three key attention skills are enhanced. These are *sustained attention* (the ability to sustain attention to a target); *response inhibition* (the ability to inhibit reactive behaviour via a non-judgemental awareness of thought and sensation), and *attention shifting* or *response re-engagement* (the ability to switch attention at will back to the intended task at hand via greater experiential awareness and cognitive flexibility). The mindfulness (body scan) meditation used by Cayoun is consistent with other proponents of traditional mindfulness meditations, such as Williams (2010) who advocates a cyclic body scan process of mindful attention and awareness that (a) shifts attention from one body region to the next, (b) that engages attention at that site, (c) maintains attention at that place on the body to explore sensations, and (d) then disengaging attention before starting over again at "a".

Stage 2, the *exposure stage*, is the stage during which clients learn to decrease their habitual reactive tendencies to troubling external situations through several exposure procedures. Imagery and then *in vivo* techniques are used to simulate troubling situations where an attitude of equanimity (balance and composure) to arising thoughts and sensations – developed in stage 1 – is used to reduce experiential avoidance and increase self-confidence. This stage emphasises the Buddhist principle that learned behaviours, cognitions, and emotions lose their strength when they are not reacted to (Cayoun, 2011).

Stage 3, the *interpersonal stage*, entails externalising attention towards others in a way that attention is not self-focused. The key is to build the interpersonal skill of experientially understanding others and their way of communicating while also developing assertiveness skills. The aim of this process is to prevent reaction to others' reactivity to enhance well-being. Stage 4, the *empathy stage*, teaches ethical awareness, self-compassion and compassion for others, and empathy that is "grounded in the bodily experience of the present moment." In essence one learns to feel connected to the self and others (Cayoun, 2011, p. 12).

Clinical use of the MiCBT is intended to alleviate the suffering from disorders such as generalised anxiety disorder, social phobia, post-traumatic stress disorder, dysthymic disorder, major depressive episodes, chronic pain, attention deficit hyperactivity disorder, obsessive compulsive disorder, panic disorder with agoraphobia, chronic depression, binge eating and diabetes, and borderline personality disorder (see Cayoun, 2011).

Competing Time Demands and Compliance to Mindfulness Training

People in general are motivated to engage in long-term self-regulated activities if they perceive the task to be realistic (tangibly achievable) intrinsically rewarding, and challenging (e.g., Jones, Harris, Walker, & Coggins, 2005; Vollmeyer & Rheinberg, 2006) and therefore

motivating high engagement in the task and future persistent behaviour (e.g., Csikszentmihalyi & Rathunde, 1992). Carmody and Baer (2008) noted that since participants in mindfulness-based intervention programs usually have competing time demands, it is important to develop a mindfulness-meditation practice that does not encroach too much upon their current responsibilities in terms of time commitment to home practice while at the same time facilitating a change in well-being within a short time period.

Brief Mindfulness Meditation Training

While acknowledging the efficacy of the extensively used eight-week mindfulness based stress reduction (MBSR) program which requires 45 minutes per day to practice formal meditation and the investment of one day at a silent retreat, a drawback of this comprehensive program is the commitment in time and cost that may not always be a viable option for the average non-clinical, non-professional competitive cyclist. Even when considering the less resource taxing MiCBT (Cayoun, 2011) eight-week program, finding time to invest at least 60 minutes of formal meditation per day is difficult for already time poor (family, full-time work, and existing cycle training commitments) competitive amateur cyclist.

To deliver a mindfulness meditation training program that is effective, accessible, and attractive for the time poor amateur competitive athlete an achievable (realistic) time allocation for formal meditation per day may be the top priority in order to facilitate initial short-term compliance and longevity of interest and training. Thus, what level of time exposure to guided mindfulness meditation training can be deemed effective while acknowledging the factor of achievability? Based on a randomised (non-clinical) control study by Zeidan, Johnson, Gordon, and Goolkasian (2010) which examined the effects of brief mindfulness meditation on mood and cardiovascular variables, it may be that that 20 minutes a day of formal training over three

consecutive days is an effective exposure period to facilitate the enhancement of self-regulation, reduce overall negative states including depression, tension, fatigue, anxiety, confusion, and improve heart rate. The researchers pointed out that their results were consistent with those found in studies examining the effects of long-term meditation practice, and referred to the research results of Grossman, Niemann, Schmidt, and Walach (2004) and Lutz et al. (2008).

Similarly, research by Tang et al. (2007) that examined the effects of short-term meditation training on attention and self-regulation found that those students who were randomly assigned to five days of 20-minutes of integrative body-mind training (IBMT) showed greater improvement on their assessment of conflict, displayed less anxiety, depression, anger, and fatigue while reporting higher vigour compared to those participants in the control condition. Further, Tang et al. (2009) reported on the effectiveness of the short-term IBMT program on changes in the central and autonomic nervous system (ANS) and argued that during and after meditation sessions participants displayed enhanced ANS regulation with less effort and more relaxation of body and calmness of mind. More recently, Tang et al. (2010) reported results that indicated short-term meditation with an exposure to training that ranged between six and 11 hours is effective in inducing changes in "functional anisotropy in the anterior corona radiate associated with the anterior cingulate cortex (ACC), a key node of the self-regulation network" (p. 15650).

Thus it seems that although more experience in meditative practice may be preferential, as little as 100 minutes of formal guided meditation training (from a trained facilitator) can facilitate an enhancement of emotional and physical regulation. Hence there is a rationale that a mindfulness protocol recommending at least 30 minutes of formal meditation per day over a

period of eight weeks will provide the framework for an effective and realistically achievable program intended to facilitate mindfulness and flow in a sample of competitive cyclists.

Structured Informal Mindfulness Training

In order to make a mindfulness program more accessible for the majority of weekend warrior competitive cyclists, an efficacious and time-considerate programme may be best. Such a program must also consider developing mindfulness in a specific generalised way so that mindfulness is integrated into motion, a non-formal mindful spin bike practice that allows for the fundamental elements of mindfulness to be experience while exposed to the rigors of strenuous physical and emotional taxing exercise such as that found in cycle training and competition. Programs like MBSR do consider mindfulness in motion; however, the hatha yoga component in the MBSR program may not be physically demanding enough to elevate heart rates and muscle discomfort and fatigue to the level that is of the equivalency of stationary spin bike training. The rationale for introducing a mindful spin bike session would be to systematically integrate mindfulness concepts into in vivo situations where developing attentional and emotional self-regulation skill would promote generalisability of mindfulness to competitive sport without being overwhelmed by the frenetic nature of pre-competitive factors (e.g., pre-race nerves, self-other comparisons, judgemental self-expectations).

Mindfulness as a Dispositional Characteristic

Mindfulness is often referred to as a dispositional, or trait-like, construct (Brown & Ryan, 2003). Without consistent conceptualisation of mindfulness and reliable and valid measures to capture a propensity to be mindful, clinical and research interventions run the risk of not tapping the same construct. From the traditional Buddhist conceptual meaning of sati, extended conceptualisations or components of mindfulness have emerged in Western literature and

research. In an attempt to find consensus on the issue of an operational definition of mindfulness, Bishop et al. (2004) proposed two components. The first involves the self-regulation of attention of present moment experience accompanied by the increased recognition of mental events. The second entails the adoption of a particular orientation for present moment experience that includes curiosity, openness, and acceptance. As defined in the writings of prominent mindfulness experts (e.g., Brown et al., 2007a; Cayoun, 2011; Kabat-Zinn, 1982, 2005; Teasdale et al., 2002), aspects of the second component defined by Bishop et al. (2004) could be expanded to include facets such as non-judgemental, non-reactivity to inner experience, detached self-observation, and compassion.

Based on the investigation of benefits of mindfulness on mental health and self-regulatory ability and increases in well-being, several self-report measures of dispositional mindfulness have been devised. There has been discussion regarding the reliability and content validity of each of these measures, specifically regarding consensus on conceptualisation or key aspects of mindfulness on an operational level (e.g., Coffey, Hartman, & Fredrickson, 2010). Moreover, there are questions regarding which of the measures are most appropriate for use in experienced and non-experienced meditating samples (Bergomi, Tschacher, & Kupper, 2012, 2013; Van Dam, Earleywine, & Danoff-Burg, 2009). Thus six current and independently validated trait mindfulness measures will be discussed in relation to strengths and possible weaknesses in considering the most appropriate option currently available for the use in the present cross-sectional relational and mindfulness-based intervention research.

Dispositional Mindfulness Scales

The Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) is a 15-item measure that assesses a propensity for everyday mindful states as a single mindfulness factor of

attention. One concern is that the MAAS focuses too exclusively on attention, thus forsaking other key aspects of mindfulness such as acceptance (Bergomi et al., 2013). The Freiburg Mindfulness Inventory (FMI; Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006) measures experienced meditators' responses on a trait level of mindfulness via 14-items (short form). The 14-items represent two dimensions that comprise of *presence* – attention to present moment experience – and *acceptance* – a non-judgemental attitude. It may be that the long and short forms of the FMI are not appropriate for the use in populations unfamiliar with the traditional concepts inherent in mindfulness as some items seem to be misunderstood by individuals who do not have meditation experience (Bergomi et al., 2013).

The Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2006) is a 12-item scale that is based on four facets of mindfulness – *attention, present-focus, awareness,* and *acceptance/non-judgement*. The CAMS-R is designed to capture a general propensity and capacity for experiencing mindfulness in everyday activities via a single convergent score. As the scale was designed to capture a type of mindfulness that would be beneficial in treating depression (Hayes & Feldman, 2004), it has been suggested that the CAMS-R may be more relevant to clinical than non-clinical use (Bergomi et al., 2013).

The Southampton Mindfulness Questionnaire (SMQ; Chadwick et al., 2008) consists of 16-items that represent four aspects of a mindful attitude towards distressing thoughts and images – *mindful observation, letting go of and non-reaction, decentered open awareness of experience,* and *acceptance.* The SMQ seems well-suited to the assessment of a mindful attitude in relation to distressing inner experience on a clinical mental health level and possibly not so well-suited to the everyday evaluation of mindfulness (Bergomi et al., 2013).

The Mindfulness/ Mindlessness Scale (MMS; Bodner & Langer, 2001) consists of 21-items that relate to four subscales: novelty seeking (6 items), novelty producing (6 items), flexibility (4 items), and engagement (5 items). The scale assesses an individual's propensity to be mindful. In factor analysis research by Kee (2006, as cited in Kee & Wang, 2008), eight items were found to reduce the construct validity of the questionnaire used, thus in the Kee and Wang (2008) case study the eight items were removed giving way to a 13-item abridged version of the scale. Kee and Wang (2008) have expressed concerns regarding the cultural implications of using the MMS in populations in non-Western cultures due to the Western development of the scale. Despite these concerns, Kee and Wang found support for the MMS as a valid tool to assess facets of mindfulness based on a Western cultural adaptation of mindfulness.

As a forerunner to the 39-item Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), the Kentucky Inventory of Mindfulness Scale (KIMS; Baer, Smith, & Allen, 2004) – also 39-items – assesses a general propensity to be mindful in daily life across four aspects or facets of mindfulness – *observing, describing, acting with awareness,* and *accepting without judgement.* In developing the FFMQ, Baer et al. (2006) integrated scale items from the five independently validated dispositional mindfulness measures reviewed above (MAAS, FMI, SMQ, CAMS-R, KIMS) and loaded these 112-items into a confirmatory factor analysis. The hierarchical model produced a five factor model of mindfulness.

Baer et al. (2006) subsequently conceptualised mindfulness as a multifaceted construct that consists of five related skills. *Observing* is described as a propensity for noticing and attending to internal sensations, emotions, and cognitions along with external experiences such as sights, sounds, and smells. *Describing* entails the labelling of observed internal and external

events with words. *Acting with awareness* describes the skill of remaining attentive and aware of ongoing activity. Baer, Samuel, and Lykins (2011) suggest the skill of acting with awareness is in stark contrast to automatic behavioural response to stimuli (an automatic pilot mode). *Non-judging of inner experience* refers to not taking a judgemental and evaluative stance in relation to cognitions, emotions, and sensations. *Non-reactivity to inner experience* involves allowing thoughts and feelings to simply come and go without being influenced or caught up with an interpreted meaning of them (Baer et al., 2011) or whereby a sense of identity is fused with or hooked by internal emotions and cognitions (Roemer & Orsillo, 2010), a concept akin to that of decentring; the ability to "step outside of one's immediate experience, thereby changing the very nature of the experience" (Safran & Segal, 1990, p. 117).

Cayoun (2011) suggested that self-reporting methods of personal mindfulness skill may be extremely sensitive to one's ability to be mindful and it may be that it is not uncommon for a person who has not meditated before to misinterpret the meaning of some of the items on the FFMQ. Cayoun argues that in order to understand what mindfulness truly is one needs to have some experience with it. Supporting this claim, Van Dam et al. (2009) found that non-practitioners of mindfulness meditation understood 18-items out of the 39-items on the FFMQ very differently to those who practiced mindfulness meditation, in what they called a difference in item functioning (DIF). Yet in the Van Dam et al. study a limitation of not matching non-meditating and meditating samples by demographics (i.e., age, gender, or education) was conceded, suggesting DIF may have be due to demographic factors and not meditation status. In rebuttal, a replication study by Baer et al. (2011) of demographically matched non-meditators and meditators produced results that indicated evidence of a minimal degree of DIF. There was little to no evidence found for differential relationships between positive and negatively worded

items when comparing responses of meditators and non-meditators. These findings suggest a non-probabilistic issue in directional scoring on the FFMQ when comparing demographically similar meditators and non-meditators. Recent research by Cathcart et al. (2014) found psychometric support for the validation for the FFMQ, suggesting the FFMQ, which assesses a five facet model of mindfulness, may be an effective tool in measuring dispositional mindfulness in elite athletes.

For the current thesis – which includes two studies that assess mindfulness change over an eight-week mindfulness training intervention that utilised meditation – it was paramount that a mindfulness scale be used that can assess mindfulness in a demographically similar sample of cyclists. The aim was to consistently capture valid and reliable perceptions of everyday mindfulness, beginning with the perceptions of participants who at baseline had no prior experience with mindfulness meditation, and then again at post-intervention—when logically mindful-meditation experience had significantly increased mindfulness ability. Thus based on the above review of mindfulness measures, the FFMQ was deemed to be the most logical and suitably available measure at the time.

Recently, the Mindfulness Inventory for Sport (MIS; Thienot et al., 2014) was devised out of the perceived need for a sport-specific mindfulness scale because of the increasing prevalence of mindfulness-based interventions in sport. The 15-item three-factor scale assesses the awareness of disruptive stimuli and related internal reactivity, an attitude of non-judgemental non reactivity, and wilful shift of attention (refocus ability) on the intended goal cues. The authors point out that the MIS correlates significantly with conceptually linked constructs such as flow, worry, and concentration disruptions. Given the specific focus of the MIS in assessing mindfulness in athletes and concepts similar to those under examination in the current

investigation, it was unfortunate that the MIS was not fully validated or readily available at the time of the current investigation. Notwithstanding, from the outset the MIS seems to be compatible with research such as the current proposal, which prompts the recommendation that future mindfulness-based intervention research should further validate the effectiveness of the MIS to assess mindfulness facets most influential in the facilitation of athletes' flow and competitive pursuits.

Attentional and Emotional Self-regulation through Mindfulness Meditation Training for Athletes

Especially relevant to competitive endurance cyclists may be mindfulness meditation with an emphasis on prolonged exposure to sensations of discomfort or pain (and associated thoughts). In the absence of catastrophic consequences, this may lead to a desensitisation process whereby, over time, a reduction in cognitive and emotional automatic response (equanimity) may inhibit attention saliency on pain and discomfort (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985; Zeidan et al., 2012). Similarly, this mechanism of sustained non-judgemental exposure to stimuli may reduce emotional reactivity when experiencing symptoms of stress and anxiety (Cayoun, 2011; Kabat-Zinn, 2009; Kabat-Zinn et al., 1992), and negative mood and depressive symptoms (Zeidan et al., 2010).

Thus via mindfulness meditative training, an individual may learn how to regulate attention and emotion which, in turn, may enhance a sense of self-control and self-efficacy in the face of stressors that cue anxious thoughts and sensations and the perception of pain (Cayoun, 2011). Proponents of mindfulness argue that it is not the thought content, nor the situation or the stressor (giving rise to the anxious somatic sensation, thought disruption, worry,

or irrational belief) that needs to be avoided or changed, it is the relationship one has with thoughts and sensations that needs to be modified (Cayoun, 2011; Williams et al., 2007).

Empirical Mindfulness Research in Sporting Populations

Promising research relates to the theory that greater mindfulness ability (via enhanced self-regulation of attention and emotion) will facilitate flow in athletic activities. Recent literature has expanded in this area to provide greater conceptual understanding regarding the relationships between mindfulness and flow in athlete populations. For example, in a cross-sectional study by Kee and Wang (2008), clusters of high and low levels of dispositional mindfulness were identified in182 university student athletes. From four mindfulness clusters (low to high mindfulness), those athletes high in mindfulness were also found to experience greater frequency in the flow dimensions of challenge-skill balance, clear goals, concentration on the task at hand, sense of control, and a loss of self-consciousness as opposed to those athletes identified as low in mindfulness. The authors linked these flow dimensions to the mindfulness concept of attentional self-regulation that has been proposed by Bishop et al. (2004). Kee and Wang (2008) suggested the findings supported the claim that a greater propensity to be more mindful creates a greater opportunity to experience flow states. Correlational research by Cathcart et al. (2014) is consistent with the claim made by Kee and Wang (2008). Using a different assessment of mindfulness, these authors found that greater mindfulness was associated with increased frequency of flow and that experiencing greater occurrences of flow states may be enabled by increasing a propensity to be more mindful through training (as suggested by Schwanhausser, 2009).

Bernier, Thienot, Codron, and Fournier (2009) also found support for a link between mindfulness and flow. In this study the descriptive investigation of 10 elite swimmers'

qualitative descriptions of being in flow showed striking similarities to characteristics inherent in being more mindful. Specifically, swimmers' descriptions of flow included comments pertaining to feeling more mindfully aware and accepting of body sensations.

A recent study by Aherne et al. (2011) found support for the efficacy of a six-week mindfulness protocol in increasing athletes' mindfulness and flow. In this control trial study, six athletes in the experimental condition showed greater increase in state flow during a specific activity compared to the seven athletes in a control condition. This finding indicates that the mindfulness-based protocol was effective in facilitating global flow on a situation-specific level. The authors suggested that future research should examine these effects in a greater number of athletes. In comparing the Kee and Wang (2008) and Aherne et al. (2011) findings, it is useful to point out that different aspects of flow were assessed. In the Aherne et al. study, a situational-specific flow state scale was used, while the Kee and Wang (2008) study used the dispositional frequency based flow scale. As suggested by Jackson and Kimieck (2008), these constructs and scales are not equivalent but may be complementary.

Two earlier mindfulness-based intervention studies have also provided varied support for the efficacy of mindfulness-based training to increase flow. Kaufman et al. (2009) employed a four-week mindful sport performance enhancement program (MSPE) to facilitate changes in trait mindfulness and flow along with state measures of mindfulness and flow. Random assignment of the 32 athletes – 11 archers and 21 golfers – was not possible, thus the findings do not clearly show causality. Key findings suggested the program showed promise in promoting state flow. The authors suggested that the brevity of the program may have accounted for the lack of significant change in trait flow over the course of the intervention. Dispositional change may take longer than state change.

Schwanhausser (2009) found some support for a mindfulness-acceptance-commitment (MAC) based sport intervention to promote mindfulness and flow. In a one-person case study that examined the effects of a nine-week mindfulness-based intervention protocol, Schwanhausser found tentative support for the enhancement of attentional self-regulation, value actions to promote greater levels of mindfulness and flow. Caution must be used when evaluating results of a one-person case study, however.

Although peak performance is not a specific focus of the current thesis, it does, however, warrant brief review in relation to mindfulness due to a link with the optimal experience of flow (Jackson, 2000; Jackson & Roberts, 1992). Research has demonstrated varied efficacy for mindfulness-acceptance training protocols to enhance sports performance over multiple athletic domains. For example, an experimental study using the MAC protocol was found to enhance performance in one swimmer and one power lifter who previously had a history of poor athletic performance (Gardner & Moore, 2004). Additionally, mindfulness training was influential in enhancing seven young elite golfers' performances (Bernier et al., 2009). Performance enhancement as a result of mindfulness-based intervention has also been found in a study of 25 recreational long-distance runners (De Petrillo et al., 2009) and another study containing four archers, eight golfers, and 13 runners (Thompson et al., 2011).

While all of the above mindfulness in sport studies showed some evidence for the usefulness of mindfulness to promote attentional and emotional self-regulation to optimise flow and performance enhancement, there are several noteworthy gaps in these areas of investigation. For example, several studies have noted the limitation of small sample size in relation to statistical power (Aherne et al., 2011; Bernier et al., 2009; Gardner & Moore, 2004; Schwanhausser, 2009), inability to incorporate a control group into the experimental design to

rule out experimental bias effects (De Petrillo et al., 2009), case studies of one or two participants (Gardner & Moore, 2004; Schwanhausser, 2009), or a cross-sectional design that is limited in establishing causation (Cathcart et al., 2014; Kee & Wang, 2008).

The studies reviewed varied somewhat in conceptualisation and assessment of mindfulness. For example, Kee and Wang (2008) assessed mindfulness tendencies via the mindfulness/mindlessness scale which was developed by Bodner and Langer (2001) to assess an individual's mindfulness propensity from the perspective of a Western adaptation of mindfulness. The research by Moore (2013) and Cathcart et al. (2014) assessed mindfulness facets that reflect a more traditional Eastern conceptualisation of mindfulness through the CAMS-R and FFMQ, respectively.

Paradoxical Issues Relating to the Implementation of Traditional Mindfulness Concepts within Competitive Sport Environments

Adapting centuries of Buddhist mindful traditions to meld with a Western competitive sport ethos of striving to achieve goals poses several difficulties. Kabat-Zinn's (1982, 2009) seminal work that integrated traditional Eastern mindfulness practice into the Western secular therapy of mindfulness-based stress reduction and sport performance (Kabat-Zinn et al., 1985) has forged the way for other mindfulness protocols in clinical settings and in sport. Any mindfulness protocol for competitive sport must address that in the Western culture of competitive sport there is a focus on striving to attain outcome goals in what could be termed a win at all cost mentality (Birrer et al., 2012). Striving to win may not be the focus or goal for many non-elite athletes; however, winning is a core aim for most elite athletes.

Birrer et al. (2012) point out that the apparent goal paradox in relation to striving to attain desired goals in competitive sport and the non-striving concept pertaining to the attitude of

liberating desire and will that is practiced in traditional mindfulness meditations can be somewhat disentangled by examining the mindfulness concepts of awareness (attentional self-regulation) and acceptance. Birrer et al. suggest that highly successful athletes tend to adopt a mindfulness attitude through greater awareness that an outcome-orientated focus on winning can inhibit present moment performance and automaticity. This point is consistent with Orlick (2000) who suggests that being engaged in the present moment sport experience is the ultimate goal in and of itself. Similarly, former NBL player and Coach Phil Jackson states:

> Basketball is a complex dance. To excel, you need to act with a clear mind and be totally focused on what everyone on the floor is doing. Some athletes describe this quality of mind as a "cocoon of concentration." But that implies shutting out the world when what you really need to do is become more actively aware of what's happening right now, this very moment. (Jackson & Delehanty, 1995, p. 116)

These qualitative competitive sport accounts pertaining to a mindful attitude seem to suggest a mindful focus of attention may promote strong flow state characteristics. For example, Jackson's following statement indicates that low awareness of the behaviour of striving for outcome goals in effect inhibits experiencing optimal experiences in sport. Jackson states "…my obsession with winning had robbed me of my joy in the dance" (p. 202), the enjoyment of being lost in the action and the experience of the moment, a freedom from self-consciousness enabling one to use all creative resources to facilitate an effortless unison with others and in one's self (Jackson & Delehanty, 1995).

Highly successful athletes tend to be more aware of and focus attention toward present moment experiences. However, the concept of acceptance presents another paradox common to competitive sport. Birrer et al. (2012) suggest mindfulness protocols applied to sports need be

aware that traditional conceptualisations of acceptance may often be misinterpreted by some athletes as a kind of resignation to one's fate or giving up due to the perception that an opponent is stronger and thus concluding the competition will end in a loss regardless of effort. This point is consistent with Robins et al. (2004, p. 40) who point out that "the Middle English root for the word accept is *kap*, meaning to take, seize, or catch". Thus from the Eastern Mindfulness perspective Robins et al. argue that when learning to accept one's situation mindfully a person will "fully enter into and embrace whatever is in the present moment"(p. 40), as opposed to resigning to a perceived inevitable fate.

Therefore it is vital that the facilitator of mindfulness training frames the traditional concept of acceptance and openness to experience as an objective attitude that naturally arising thoughts and sensations are just thoughts and sensations and to accept the occurrence through an understanding of its impermanent nature (Cayoun, 2011). It must be conveyed that through an understanding of equanimous attitude, the awareness of naturally arising thoughts and sensations are not judged, controlled, nor reacted to. That is, thoughts arise; they remain in consciousness for a relatively short time and then fade away. Thoughts and co-occurring sensations are just a mental event, objects that a person may objectively pay attention to but without attachment to the self or reality (Williams et al., 2007). Thus, as Kabat-Zinn eloquently points out, a mindful accepting person learns to understand that "You can't [sic] stop the waves but you can learn to surf" (Kabat-Zinn, 2005, p. 30).

Additionally, Langer (2000) has pointed out an apparent paradox between the automaticity of learned basic skills (mindless doing out of a reactive habit) that is commonly promoted within a competitive sport ethos, and that of the Western conceptualisation of the traditional Eastern philosophy of "being" in and mindfully aware of present moment experience.

Baer et al. (2011) have termed this process as acting with awareness within the present moment experience. From this perspective, a mindlessness mode of “doing” exemplifies the automaticity of mental and physical behaviours, especially in sport. Langer (2000) suggests that when athletes are required to learn basic skills, the repetitive doing behaviour strengthens patterns of automatic response, enhancing skill acquisition.

Overlearning to facilitate automatic behaviour is adaptive in the sense that in sport fast response and acting instinctively frees up finite attention to be redirected to the task at hand, thus enabling absorption. Yet when automatic behaviour reaches a level of mindlessness, this type behavioural responding can impede present moment performance (Langer & Imber, 1997). Langer and Imber imply that the repeated process of learning basic skills in life has the adaptive advantage of increasing the speed of task performance. However, this same process may have debilitating effects whereby the cognitive flexibility (to facilitate letting go of unhelpful thoughts and emotions to refocus sustained attention back on the vital task at hand; e.g., Cayoun, 2011) and skill needed to rise to the level of an unpredictable challenge may be compromised due to becoming less aware and attentive to the particular facets of the task. In effect, the overlearned and well-rehearsed skill becomes an automated mindless whole, where the awareness and attention to the sum of its vital parts that facilitate successful completion of the task are lost. That is, to speed up response we quickly learn to ignore certain elements deemed no longer integral to the process. However, if these elements are repeatedly ignored to the point that they can no longer be accessed, when unexpected changes to a performance necessitate adaption of the automated skill, the athletes lack the cognitive (attention and awareness) and physical flexibility vital to meet the change in challenge (e.g., Langer & Imber, 1997).

In elite competitive cycling, the mindless behaviour of performing while on autopilot is linked to poor performance and a dissociative focus of attention (e.g., Kress & Statler, 2006). Acting with awareness of well learned skills can promote optimal sport experiences through cognitive and behavioural flexibility. Over-reliance on over-learnt skills can lead to a dissociative mindless focus of attention whereby repeated use of an autopilot mode reinforces a mindless reactive behavioural response that leads to low quality of experience and poor performance.

Many competitive sports, including cycling, are played out in environments where ever-changing and unpredictable circumstances arise (i.e., unfamiliar or changing climate conditions, stronger opponents). Thus , acting with awareness in the present moment experience and flexibility of attentional processes (self-regulation of attention and awareness of both internal and external stimuli), emotion composure (equanimity when aware of self-doubt), and skill adaptability to supersede mindless patterns of automatic behavioural responding (automatic doing mode) to adaptively and unambiguously read performance feedback to suitably adjust and inform action to rise to the change in challenge are important.

The Current Investigation

The current investigation seeks to advance the promising body of research focused on mindfulness and flow in sporting populations. An overall aim is to investigate connections between mindfulness and flow. A specific focus is on how mindfulness facilitates the sequential process of flow which was initially proposed by Kawabata and Mallett (2011), and based on Nakamura and Csikszentmihalyi's (2005) conceptualisation of a model whereby the satisfaction of flow conditions flow may facilitate flow state characteristics. That is, the current thesis investigates the connection between self-regulation of attention and emotion, which may be

facilitated through mindfulness, in optimally enabling the satisfaction of flow conditions to facilitate greater frequency of flow experiences. Another focus of the thesis is to examine how lower anxiety and pessimism may connect mindfulness to flow. Mindfulness may reduce the likelihood of athletes experiencing anxiety and pessimistic thoughts and, in turn, lower anxiety and pessimism which may increase the likelihood of athletes experiencing flow.

The current investigation also seeks to tailor mindfulness training to athletic populations. In order to develop generalisable skill acquisition and growth of mindfulness abilities — developed in formal mindfulness training — to be effectively integrated into in competitive environments, a bridging element needs to be developed. For example, in order to transition cyclists from formal mindfulness-meditation training – that is commonly conducted in a quiet and tranquil environment in a comfortable static seated position – through to the physically demanding environment of competitive racing, a mindfulness while in motion exercise will be introduced into two mindfulness intervention studies.

Preliminary Introduction of the Three Empirical Studies

Study 1: Buddhism on a Bike: The Relationship between Mindfulness-Acceptance, Sport Anxiety, Pessimistic Attributions and Flow in Competitive Cyclists Flow.

This cross-sectional design study investigated a model connecting greater mindfulness to more occurrences of flow and fewer sport-specific anxiety and pessimistic sport attributions in 133 competitive cyclists. The research examined direct and indirect paths from mindfulness to the subjective state of being in flow. Indirect paths examined were pessimistic sports attributions, sport-specific anxiety, and flow conditions.

Study 2: Effects of a Mindfulness Intervention on Sports-Anxiety, Pessimism, and Flow in Competitive Cyclists.

Building on the results of Study 1, this study examined the impact of a mindfulness-based intervention on mindfulness, flow, sport-anxiety, and sport-related pessimistic attributions in competitive cyclists. Cyclists were assigned to an eight-week mindfulness intervention which incorporated a mindful spin-bike training component or a wait-list control condition. Participants completed baseline and post-test measures of mindfulness, flow, sport-anxiety, and sport-related pessimistic attributions.

Study 3: The Role of Engagement in the Effects of a Mindfulness Intervention for Competitive Athletes.

This study examined the role of degree of engagement in a mindfulness-based intervention on mindfulness, flow, sport-anxiety, and sport-related pessimistic attributions in athletes. Athletes participated in an eight-week mindfulness intervention which incorporated a mindfulness while in motion training component. Participants completed baseline and post-test measures of mindfulness, flow, sport-anxiety, and sport-related pessimistic attributions, and filled out daily mindfulness-training logbooks documenting their frequency and duration of mindfulness practice. Participants were identified as either high engagement or low engagement with mindfulness-training based on logbook practice records.

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Chapter 4

Study 1

Buddhism on a Bike: The Relationship between Mindfulness-Acceptance, Sport Anxiety, Pessimistic Attributions, and Flow in Competitive Cyclists

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The findings in Study 1 suggest that a greater propensity to be more mindful enhances the frequency with which a cyclist may satisfy flow conditions to experience a greater occurrence of flow states. The results of this study provided the basis for an intervention study intended to provide more information regarding causal connections between mindfulness, anxiety, pessimism, and flow. This next study examined the effect of a tailored eight-week mindfulness-based protocol for competitive cyclists in facilitating mindfulness and to promote flow conditions in order to increase the occurrences of flow state experiences. Additionally, Study 2 examined the effect of the mindfulness intervention on reducing sport-related anxiety and pessimistic attributions.

Chapter 5

Study 2

Effects of a Mindfulness Intervention on Sports-Anxiety, Pessimism, and Flow in Competitive Cyclists

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Pervious literature indicates that engagement in and or adherence to mindfulness training is vital factor in achievement of mindfulness (Cayoun, 2011; Kee & Wang, 2008; Quinones-Paredes, 2014). Levels of engagement in mindfulness training have not yet been the focus of examination in mindfulness intervention research with athletes, especially not in relation to flow facilitated by mindfulness. Based on the literature on the importance of engagement with mindfulness training, it is possible that high engagement in mindfulness training will enhance mindfulness skills and promote greater flow occurrence.

Chapter 6

Study 3

The Role of Engagement in the Effects of a Mindfulness Intervention for Competitive Athletes

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Chapter 7

General Discussion and Conclusions

Overview of Findings

Together, the three empirical studies comprising the current examination of the relationship between flow and mindfulness in sport extend previous research literature (e.g., Aherne et al., 2011; Bernier et al., 2009; Briegel-Jones et al., 2013; Cathcart et al., 2014; Gardner & Moore, 2004; Kaufman et al., 2009; Kee & Wang, 2008; Moore, 2013; Schwanhausser, 2009; Quinones-Paredes, 2014). The current research found support for the efficacy of a tailored eight-week mindfulness training protocol to enhance competitive athletes' mindfulness to sequentially promote a greater propensity and frequency to experience flow states.

From Study 1, significant findings supported a proposed indirect effect of mindfulness on flow through paths of decreased sport-related anxiety and pessimistic attributional processes. Support was found for the proposed process of a two combined subscales model (flow conditions and flow characteristics) of dispositional global flow. This finding is consistent with the Csikszentmihalyi (2000) and Nakamura and Csikszentmihalyi (2005) operational definition of flow that suggests that the satisfaction of flow conditions is vital to the promotion of characteristics that define the experience of being in a flow state.

The findings of Study 1 helped inform and develop the following two mindfulness training interventions. Studies 2 and 3 examined the effectiveness of an intervention intended to increase athletes' mindfulness and flow and decrease athletes' anxiety and pessimism. These two studies found that the sport-tailored mindfulness intervention increased mindfulness and flow and showed some mixed evidence in impacting anxiety and pessimism. Greater changes in mindfulness were related to greater changes in flow. Study 3 additionally suggested that greater engagement with mindfulness training is an important factor in the effectiveness of such training.

Although athletes in general are referred to in the following discussion, in Study 1 and 2 competitive cyclists were the specific focus. In Study 3 all but two of the 12 athletes examined were competitive cyclists. This sporting population provided the opportunity to test the premises of the thesis for several reasons. Competitive cycling is a sport that provides the structure and growing complexity in challenge to promote the opportunity to optimally stretch skill to potentially facilitate flow (e.g., Nakamura & Csikszentmihalyi, 2005). Additionally, it may be that endurance cycling elicits attention disrupting factors such as dissociative focus of attention (e.g., Carmichael & Rutberg, 2012), pessimistic and anxious thought processes that may be beyond awareness, and salient physical factors such as discomfort and pain (e.g., Kress & Statler, 2006). Thus these habitual attention strategies that diminished attentional capacity and sustainability will potentially impede the attainment of satisfying flow conditions prior to competing. Attention focused on thoughts not related to performance feedback, or a misattribution or over-evaluation of performance feedback that is focused on self-deficiencies, may disrupt flow states when competing if not accepting and mindfully aware.

Key Findings from Each Study

Key findings from the initial investigation of 133 competitive cyclists in Study 1 included the observation that higher levels of mindfulness were associated with significantly fewer sports-related pessimistic cognitions and significantly less sport-specific anxiety. Furthermore, lower levels of sport-specific pessimistic attributions and sport-specific anxiety were associated with a higher frequency of experienced flow conditions. A higher frequency of flow conditions was associated with greater occurrence of the subjective state of being in flow. The results supported the proposed model connecting mindfulness to flow experience through the meeting of flow conditions and through less experience of pessimism and anxiety.

Additionally the findings identified that the satisfaction of flow conditions may play an integral role in the process of enabling characteristics that lead to a flow state experience. These results further strengthen the argument that enhanced self-regulation of attention and emotion is vital to the process of inhibiting concentration disruptions brought about by attention focused on non-task relevant cognitions and sensations (worry, fear of failure) and self-judgemental cognitions (perceived doubt and inability) that are fused with a sense of self that ultimately impedes self-confidence and reduces motivation to engage with future challenges. Thus the key findings of Study 1 are consistent with past mindfulness in sport research (De Petrillo et al., 2009; Gardner & Moore, 2004; Kaufman et al., 2009; Thompson et al., 2011) and expand the literature from a structural process-related perspective of flow (e.g., Kawabata & Mallett, 2011). The support for the direct and indirect paths connecting mindfulness and flow set the foundation for Study 2 to examine the proposed effect of mindfulness training on enhancing mindfulness to promote increases in experiencing flow.

As a part of the Study 2 methodology, 47 competitive cyclists participated in either an eight-week mindfulness intervention, which incorporated a mindful spin bike training component, or a wait-list control condition. Participants completed baseline and post-test measures of mindfulness, flow, sport-anxiety, and sport-related pessimistic attributions. Key findings indicated that cyclists in the mindfulness intervention condition showed significantly greater increases in mindfulness, frequency of global flow, and increased frequency of flow conditions, which are considered pre-requisites of a flow state, relative to wait-list control participants. Between baseline and post-test, the greater the increase in mindfulness experienced by the intervention participants, the greater the increase in the overall frequency of global flow. From the structural process-related perspective of flow, greater mindfulness promoted the

satisfaction of flow conditions which may have facilitated an increase in perceptions of flow state characteristics. The intervention also showed some support for the premise that mindfulness training and associated increased mindfulness leads to less experience of sport-related anxiety and pessimism.

Study 3 replicated the mindfulness training used in Study 2. In Study 3, a focus was on the role that high and low mindfulness-training engagement plays in the development of mindfulness, flow, and decreased anxiety and pessimism. Replicating the methodology and procedures used in Study 2, participants completed baseline and post-test measures of mindfulness, flow, sport-anxiety, and sport-related pessimistic attributions, whilst additionally filling out daily mindfulness-training logbooks that documented the ongoing frequency and duration of formal and informal mindfulness practice. Subsequently, participants were stratified – based on logbook practice records – by high engagement or low engagement with mindfulness-training. Competitive athletes high in engagement, as operationalised through adherence to recommended practice of mindfulness exercises, showed significantly greater increases in mindfulness and aspects of flow, and significantly greater decreases in pessimism and anxiety than low engagement athletes. Greater increases in mindfulness from baseline to post-test were associated with greater increases in flow and greater decreases in pessimism. Increases in flow were associated with decreases in somatic anxiety and pessimism.

The results of studies 2 and 3 confirm and build on the findings of the studies by Briegel-Jones et al. (2013), Aherne et al. (2011), and Kaufman et al. (2009). The current results also extend findings relating to the effectiveness of mindfulness training to sequential flow components and provide information regarding lowered anxiety and pessimism as processes connecting increased mindfulness with increased dispositional flow.

Mindfulness Training as a Potentially Powerful Vehicle for Enhancing Athletes' Mindfulness

In study 2, the effect of mindfulness training on the 27 intervention group cyclists' increases in dispositional mindfulness from pre- to post-test was significant and strong (d = .75). As anticipated, the effects of mindfulness change significantly contrasted to that of no significant change in mindfulness found among the wait-listed controls. These results were replicated in Study 3 which found that the high engagement athletes showed a strong increase in dispositional mindfulness (d = .79). This effect was significantly greater than the effect found for the seven low engaged athletes, $F(1, 9) = 8.69$, p =.016, partial $\eta^2 = .491$, for whom there was a small decrease in mindfulness from pre- to post-test (d = .28).

The mindfulness training used in both studies included a guided 'mindfulness-in-motion' component tailored to the athletes' sport. This component of the training was intended to help athletes practice and assimilate mindfulness-acceptance skills in relationship to their sport. In conjunction with the MiCBT protocol (Cayoun, 2011), this mindfulness while in motion training component may have contributed to the impact of the mindfulness intervention. Future research might systematically investigate the benefits of integrating sport-specific mindfulness while in motion components in mindfulness training for different sporting populations.

Enhancing Mindfulness Promotes Greater Propensity to Experience Flow

The results of the empirical studies provided support for the premise that mindfulness training promotes flow through a sequential path of fulfilment of flow conditions to flow experience. These findings expand the current mindfulness in sport literature through evidence for the efficacy of mindfulness training to promote increases in dispositional global flow and exploration of sequential paths in flow conditions connecting to flow experiences. It would

appear that the efficacy of mindfulness training in enhancing self-regulation of attention and emotion ability plays a role in prompting this sequential flow relationship. The current findings are consistent with research by Kawabata and Mallett (2011) who found sequential process-related pathways between constituents of proximal flow and flow characteristics.

In Study 2, an effect of mindfulness training on increases in dispositional flow was found. Follow-up tests for the intervention group cyclists indicated increases in global flow (d = .63), flow conditions (d = .67) and flow characteristics (d = .54), which indicate moderate effect sizes. The association between increases in mindfulness change scores and increases in global flow (r = .67), flow conditions (r = .47), and flow characteristics (r = .73) were significant and parallel the significant concurrent data collection correlations found in Study 1. For the five highly engaged athletes in Study 3, a much larger effect of mindfulness training was found on increases of dispositional global flow (d = 1.10) and flow conditions (d = .79). Additionally, a very large effect of mindfulness training on flow characteristics that define the experience of being in a flow state were found (d = 1.32). These large effects of mindfulness on dispositional flow are consistent with those found in the Aherne et al. (2011) study where the effect of mindfulness training on state global flow was d = 1.66.

The effects for the high engagement in mindfulness training athletes in Study 3 contrasts with those found for the low engaged athletes who exhibited negligible change in all flow facets from pre- to post-test assessment. After combining the data of all 12 athletes in Study 3, the pre- to post-test changes parallel that found in Study 2. In Study 3, increase in mindfulness change scores was significantly associated with increases in change scores on global flow (r = .659), flow conditions (r = .498), and flow characteristics (r = .712).

Comparing the Study 3 findings of the — combined — high and low engaged athletes' change score correlations on the relationship between mindfulness and flow facets to that of the intervention group cyclists' change scores in Study 2, near identical correlation values are evident. This finding suggests that the data from Study 2 may have yielded a greater effect of mindfulness training on mindfulness, flow, anxiety, and pessimism that was consistent with Study 3 if the role of high and low engagement could have been teased apart.

The overall aim of the current investigation was to provide a mindfulness protocol that would mesh well with athletic demands and the pursuit of optimal experience in training and competition. The evidence from the present investigations of substantial effects of mindfulness training on a greater propensity to experience the characteristics that define being in a flow state along with the findings of previous research (Aherne et al., 2011) is promising.

Inhibition of Anxiety

The combined results of all three studies indicated that greater mindfulness inhibits the effect of sport-specific anxiety concentration disruptions on optimal sport experience. In Study 1, there was a strong association found between greater mindfulness and lower scores on the anxiety subscales of somatic, worry, and anxiety concentration disruptions as well as total anxiety. This finding was consistent with the indirect path hypotheses that the effect of greater mindfulness impacts on increases of flow characteristics through a reduction of sport-specific anxiety. Lower total anxiety was most associated with greater satisfaction of flow conditions. Similarly, the anxiety sub-components of worry and somatic anxiety followed this trend. The sub-component of anxiety concentration disruption was significantly associated with flow characteristics. These findings are consistent with the claims that anxiety is the antithesis of flow

(e.g., Csiksentmihalyi, 1975) and that attention turned to non-task relevant cognitions will not only disrupt, but derail concentration while in flow (Jackson & Csikszentmihalyi, 1999).

In studies 2 and 3, the effect of mindfulness training on anxiety was most evident when comparing the negative association between a decrease in anxiety concentration disruptions and the increases in all facets of flow and dispositional mindfulness from pre- to post-test. There were associations between lowered worry, somatic, and total anxiety with greater increases in mindfulness and facets of flow.

In Study 3 there was a significant difference found in effect of mindfulness training on total sport anxiety (as a total construct) between high and low engaged athletes. However, this effect was primarily due to the small decrease in anxiety for highly engaged athletes (d = .25) as opposed to the small to medium increase in anxiety for the low engaged athletes (d = .38). In Study 2 there was a similar trend with the intervention cyclists group showing a significant decrease in total anxiety after mindfulness training (d = .61) as opposed to an increase in total anxiety in the control condition, however, this difference was not significant.

The effects of training on change in anxiety found in both intervention studies were small. Whilst the levels of sports-related anxiety were, on average, mild at baseline assessment, Birrer, Röthlin, and Morgan (2012) state that, even small effects are important in competitive sport.

Impact of Mindfulness Training on Pessimism

Mindfulness training was observed to reduce sport-related pessimism in both intervention studies. The small to medium effect in the decrease in pessimistic tendencies found for the cyclists in the intervention group in Study 2 (d = .34) and the engaged athletes in Study 3 (d = .34) suggest some impact of mindfulness training on pessimism. Again, these findings can be

viewed in light of the argument of Birrer et al. (2012) who suggest that even small effects in competitive sport are important. As with anxiety, baseline levels of pessimism were not high, so there was not great leeway for improvement.

Discussion of Active Mindfulness Protocol Ingredients that May Facilitate Change

This section highlights what may have been important aspects of the mindfulness protocol used in studies 2 and 3 in regard to facilitating changes in mindfulness, flow, anxiety, and pessimism. Birrer et al. (2012) argue that due to the multifaceted nature of sport there are both physical and mental demands. The current research focused on identifying and enhancing mental attention and regulation processes that may enhance flow. These mental processes included mindfulness, anxiety, and pessimism. Identifying factors such as mindfulness, anxiety, and pessimism that may promote or hinder flow can assist in developing training protocols that may facilitate flow. The mindfulness-based training protocol used in studies 2 and 3 centred on mindfulness training intended to develop enhanced attentional and emotional self-regulation ability to inhibit disruptive stimuli and enhance sustained attention focus.

In accord with recommendations by Teasdale et al. (2003), the active ingredients of the current mindfulness-based training were intentionally tailored to match the specific demands of the targeted sports population. Discussion of mindfulness skills, in part, focused on application to athletes' sport activities. Another aspect of tailoring was the guided 'mindfulness while in motion' component tailored to the athletes' sport; in the case of the cyclists the stationary mindful spin exercises. This component of the training was intended to help athletes practice and assimilate mindfulness-acceptance skills in relationship to their sport.

The changes in dispositional mindfulness, flow, anxiety, and pessimism found in the intervention studies may have been due to the intervention being structured around two principle

mindfulness components (e.g., Bishop et al., 2004; Cayoun, 2011). The first entailed developing a mindfulness intervention that provided suitable formal mindfulness meditation training to develop attentional self-regulation abilities that reflected traditional Eastern, and extended Western, conceptualisations of mindfulness that could be integrated into competitive cycling environments. The formal and informal mindfulness practice and education were intended to lead to sustained attention, volitional mindful attention switching ability and enhanced awareness (active monitoring of thoughts and emotions), which would allow athletes to engage with goal appropriate tasks to enable a narrow focus of attention to promote flow.

The development of attention self-regulation was coupled with the second mindfulness component of acceptance and equanimity to enhance inhibition and disengagement of attentional disruptive cognitions and feelings. This second component focused on the modification of the relationship athletes had with naturally arising thoughts and sensations. Through education and formal and informal mindfulness practice, athletes learned to acknowledge the presence of mindless automatic behavioural reactivity to facilitate a modification process that involved the development in the attitudes of acceptance, non-judgement, non-evaluation, and non-reactivity (equanimity). Through this process, athletes learned that it is actually the judgement of the event or stimuli that pains us, not the event or stimuli itself that elicits reactions.

In addressing these conceptual goals, the mindfulness intervention protocol focused on targeting and isolating the judgemental processes that maintain and strengthen each of these constructs. For example, in both studies 2 and 3, the mindfulness workshop sessions included a focus on the education that the awareness of anxious thoughts pertaining to self and others' performances and ego maintenance is important, and that the awareness of habitual self-judgemental attitudes and the somatic sensations that emanate as a result of these thoughts prior

to a performance need to be observed within an open stance and accepted as just thoughts, emotion and sensation that will come and go. By using the formal mindfulness of breathing and body scanning meditations to develop awareness and acceptance of thoughts and sensations, and by extending this process to the competitive environment through the mindful spinning exercise, athletes became increasingly more aware of how self-judgemental processes affect sport experiences.

Similarly, pessimistic thoughts and self-beliefs pertaining to perceived athletic failures were framed within a structure of modifying one's judgemental attitudes towards the self. However, the important point stressed was that unlike the salient effect of anxiety, pessimistic patterns of behaviour are much more covert. With developing awareness, participants became more conscious over the course of the eight-week intervention training that these judgemental beliefs and thoughts can impede confidence and motivation. This process and rationale is consistent with past research that indicates pessimistic attitudes impede engagement with challenges via a process of poor self-regulation of attention and emotions (Catley & Duda, 1997; Seligman et al., 1990).

The use of the interoception forms that were filled out after the weekly workshop meditation sessions were also used as a tool to help self-guide athletes through self-informed progress in the ability to be mindfully attentive and aware of internal body sensation. By emphasising the related attentional and emotional self-regulation inherently developed by engaging in formal and informal mindfulness training, the skills and experience that were developed were framed with the intention of transference over to athletic practice and competitive environments.

Another core aspect of mindfulness training was the promotion of generalisable change in dispositional mindfulness, flow, anxiety, and pessimism through the use of the mindfulness while in motion exercise. For cyclists, mindful spinning was used to generalise and transfer the enhanced self-regulation learnt from engaging fully with the formal, quiet, and static mindfulness exercises practiced at home and in class. The aim was to systematically integrate the tailored mindfulness training for cyclists into frenetic cycling environments that may normally overwhelm athletes through stimuli that cue sports-related anxieties and pessimistic attribution processes that impede concentration, confidence, motivation, and persistence.

The mindful spin component may have enabled riders to develop awareness and understanding of the automated processes which maintained old maladaptive reactive behaviours that were unwittingly used to cope with obvert and covert thoughts and sensations which disrupted attention focus. Through the repeated systematic process of mindful spin training, riders were able to co-develop sustaining awareness of attention focus – enhanced ability to shift attention at will to refocus (attentional self-regulation) and the ability to change the relationship with observed thoughts and sensations from a self-focused, inflexible, automatic judgemental, and reactive behavioural process to an equanimous one (emotional and physical self-regulation). In effect, by changing this relationship with thoughts and sensations, riders built an increased awareness of mindless action and reaction to arising stimuli and developed cognitive, emotional, and physical flexibility to inhibit disruptive stimuli to help promote greater frequency of optimal present moment experiences.

As the different components of the mindfulness training were presented together, the results of the present research cannot address which components were most effective or whether

the synthesis of components was useful. Future research might continue to systematically examine the separate and combined impact of components of mindfulness training for athletes.

Discussion of the Paradox between the Mindfulness Concept of Non-striving and Competitive Sport

The mindfulness training used in the current investigation acknowledged the importance of the issue of the apparent paradox between the attitude of non-striving and acceptance taught in traditional mindfulness training and the outcome goal focus that promotes an attitude of striving within the ethos of Western competitive orientated sports (e.g., Birrer et al., 2012). It may be helpful in encouraging athletes' engagement with mindfulness education and training that ambiguities or apparent paradoxes be cleared up or explained.

Consistent with Birrer et al. (2012) and Robins et al. (2004), the discussion of mindful-acceptance was focused on from the perspective that acceptance should not be viewed with an attitude of resignation or abandonment of effort. The attitude of acceptance was explained from the perspective that thoughts are just thoughts and emotions are merely emotions; they are not to be seen as necessarily a real reflection of the self or reality and nor are they permanent (Cayoun, 2011). Within this attitude of acceptance, troubling thoughts and discomfort brought about by physical effort are not automatically reacted to with a behaviour of disengagement of effort or a need to control or suppress the troubling thoughts. Alternatively, sensations and thoughts are observed in a neutral sense until they subside as a result of exposure without reaction, thus inhibiting future reactivity to the same stimulus. As the ability to accept grows through repeated training, the time spent neutrally observing stimuli will reduce, thus attention is redirected to the task at hand more rapidly.

Additionally, the mindfulness education used in the current research emphasised the contrast between a traditional Eastern mode of "being" mindfully present – acting with awareness within the present moment experience – versus a Western mindlessness "doing" mode that exemplifies automaticity of mental and physical behaviours, especially when striving to achieve a goal outcome in competition. Langer (2000) suggests that when athletes are required to learn basic skills, the repetitive doing behaviour strengthens patterns of automatic response to a point where mental flexibility is compromised.

Validating the Five Facet Mindfulness Questionnaire (FFMQ)

In addition to the key findings of the current research regarding the effectiveness of mindfulness training to facilitate greater mindfulness in order to promote flow, the current findings provide additional validation for the use of FFMQ in competitive sport populations. The findings support previous research that suggests the FFMQ is a useful tool for assessing a Western conceptualisation of mindfulness facets drawn from traditional Eastern mindfulness practices in competitive athletes (Cathcart et al., 2014). Although the Mindfulness Inventory for Sport Scale (MIS) was recently developed by Thienot et al. (2014) to assess mindfulness specifically in competing athletes, at the time of study one's cross sectional research and the following two intervention studies the MIS was not fully validated and accessible. However, future mindfulness training intervention would benefit from utilising a sport-specific mindfulness scale, as items for some athletes may seem less ambiguous and more relatable than the items pertaining to everyday life events contained in the FFMQ.

Limitations and Recommendations for Future Research

Study 1 used a cross-sectional design, which allowed preliminary model testing, however, did not address causal connections. The intervention designs used in studies 2 and 3

were intended to provide more insight into causal connections.

The research methodology employed in studies 2 and 3 regarding the mindfulness interventions, may have been further strengthened by the accompaniment of the assessment of flow on a situation-specific (state flow) measure to capture changes in flow accounts across eight weekly competitive race events. The Short Flow State Scale-2 (S-FSS-2; Jackson's nine item adaption of the DFS-2; Jackson & Eklund, 2002) was designed for just this purpose. However, the current investigator did not have the resources to be able to administer the pen-and-paper formatted measure for each of the participants when they completed races. Future research might collect such data to add insight into the relationship between active ingredients inherent in flow and mindfulness.

A recommendation for future research to enable this information to be captured is the development of a short flow state scale in the form of a mobile phone application. With this type of tool, athletes could be prompted (through text or voice announcement) to respond in a proficient and accessible way, potentially with the option of submitting the data automatically to the researcher. Through this method researchers could access on-the-spot data from large numbers of competitors from multiple locations without the requirement of a substantial time commitment from the researcher.

The three studies comprising this project were conducted in one country, Australia, and this may not be generalisable to other cultures. Future research might test the effectiveness of the tailored mindfulness training protocol used in Studies 2 and 3 in other cultures.

Similarly, the current research focused on competitive cyclists and may not be generalisable to other sporting populations. Future research might assess the replicability of the

research reported in Studies 1, 2, and 3 with other athletes. Possible differences between athletes engaging in individual versus team sports might be explored.

Measures of mindfulness, flow, and pessimism used in the present research were well validated and showed acceptable psychometric properties in the three studies. However, other conceptualisations and measures of these constructs might show somewhat different results. Future research could explore this possibility.

Another suggested limitation of the current research was the sample size employed and examined in Studies 1, 2 and 3. Although Study 1 examined 133 competitive cyclists from an Australian wide sample, perhaps a larger more diverse sample size may have yielded larger indirect effects of mindfulness on flow than currently found. Additionally, the participant numbers for the mindfulness intervention protocols in Study 2 (47 competitive cyclists) and Study 3 (12 competitive athletes) could be argued to have been too small. However, despite this suggested limitation the sample employed in both of these studies was more than adequate to detect medium to large effects of mindfulness training on mindfulness and flow.

Perhaps in future research, aimed at replicating the current mindfulness protocol for sport, a much larger diverse sample of athletes could yield other effects of mindfulness training not found in the current research. For example, researchers may wish to look at flow differences in athletes whom prior to mindfulness training regularly experience flow as opposed to those athletes who may have never experienced flow in their chosen sport to assess the effect of mindfulness on flow at post intervention. Moreover, future research may wish to factor in a six month follow up assessment of adherence to mindfulness training to assess continue growth in mindfulness and the enablement of frequent flow experiences.

Conclusion

In conclusion, together, the findings of studies 1, 2, and 3 suggest connections between greater mindfulness and a sequential process of flow. Attentional and emotional self-regulation inherent in mindfulness may facilitate the cognitive and emotional flexibility needed to optimally engage with a challenging task within a framework of realistic non-judgemental and non-reactive evaluation (equanimity). When this occurs, the task is evaluated purely on realistic matching of perceived skill and challenge. Sustained attention is focused on relevant and available stimuli that inform action needed to achieve the task. Rumination or erroneous interpretation of stimuli and attention focused on performance expectations is lessened during the evaluation of matching abilities and skills with the available challenge through the self-regulated ability to focus attention on task-specific stimuli in an emotionally flexible way.

The current research emphasises the efficacy of self-regulatory control of attention and emotion to channel sustained focused attention towards relevant task stimuli. Consistent with flow literature (Csikszentmihalyi, 1978), the results strengthen the claim that sustained attention focus optimises the satisfaction of flow conditions to facilitate a foundation for experiencing a flow state.

Additionally, the findings of the current research expand the literature through presentation of a model linking mindfulness with flow, in part through paths of lessened anxiety and pessimism. The findings also support the effectiveness of a tailored sport-specific mindfulness training protocol in enhancing mindfulness and promoting greater dispositional flow in athletes. The mindfulness protocol used in the current research could be adapted other sporting domains where a lack of awareness of performance anxiety and other attentional disruptions impact optimal competitive sport experience. Overall, the findings add to the evidence regarding the utility of application of mindfulness and flow concepts to athletic pursuits.

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Appendix A

Mindfulness Workshop Workbook Week….

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Instructions:

- Listen to the track that has been assigned for the week on the CD provided (track #...)
- Start your week's mindfulness practice by listening to the CD. After only a few sessions try and do the practice without the CD.
- Log you mindfulness practice for each day in the appropriate spaces on the 'schedule of mindfulness" table, see next page.
- It is up to yourself how much practice you do, be it only 5 or the full 15 minutes. Even if you do not practice that is more than fine, however, please fill in the sheet as a log.
- Remember, to strengthen your mindfulness skills you need to maintain consistent frequency, duration and accuracy of practice.
- Use the interoceptive signature homework sheet as a guide to how to label sensations, there is no need to fill out this form if you do not want to, it is simply a guide for your understanding.
- **Last of all, could you please fill in the "practice feedback" sheet (last page) at the end of the week and return the work book to me at the next session**.

Thank you and I hope you enjoy the benefits of your practice

Consent and your rights. You must give your informed consent before participation. You have the right to withdraw from this study at any time you wish. Although there is no threatening content in this study, due to ethical constraints this study is only open to competitive (at any level) cyclists aged 16 years and above. Interested juniors aged between 16 and 18 are strongly advised to obtain parental or guardian permission before attending the workshop or accessing the survey questionnaires. Parents are welcome to come along too Thank you for your time and consideration. If you have any questions or concerns about this study, please contact me on the below email or phone numbers.
Regards,
John Scott-Hamilton BPSYC(Hons)
Contact: jscottha@une.edu.au or 02 6773 5017 or mob 0422541389

Daily schedule of mindfulness practice (week …)

Type of mindfulness practice:

	Date	*a.m*	Duration	Rating %	*p.m*	Duration	Rating %
Thursday		yes/no			yes/no		
Friday		yes/no			yes/no		
Saturday		yes/no			yes/no		
Sunday		yes/no			yes/no		
Monday		yes/no			yes/no		
Tuesday		yes/no			yes/no		
Wednesday		yes/no			yes/no		

Diary and comments

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- Were you aware of any negative thoughts and feelings or habitual negative beliefs while competing over the weekend? Yes/ No
- If yes could you please elaborate?

.....

.....

.....

- Were you able to apply your mindfulness skills of non-judgmental observation without reaction?
  Yes /No
- If yes did it help? Yes / Not sure / No

Home practice feedback (week …)

Type of task_____ ID code _____

Were you able to practice the Mindfulness training? YES / NO
If yes, score the extent to which you practiced in the last week on the scale below (circle the number of times).

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14+

- Did you experience any difficulties with the task? (if yes explain below)

.....

.....

Score below the extent to which you could feel body sensations

0 1 2 3 4 5 6 7 8 9 10

Could not feel them at all — Could feel them throughout

- After practicing for a week / few days, how did you feel at the end of your practice session?

.....

.....

Score below the extent to which you feel to have benefited from practicing mindfulness.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

No observed Benefit — Extremely beneficial

Do you feel your mindfulness practice, to date, has impacted upon your recent cycling experiences either in training and/or racing? If so, could you briefly explain?

_____

_____

_____

_____

Appendix B

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Workshop feedback form

ID code _____ _____

The following questions have been written to assess if your eight-week mindfulness training has enhanced your cycling experience or performance in either training or competition. However, please feel free to additionally comment on how your mindfulness training may have enhanced your life and work in general. Any feedback, good or constructive, is invited and much appreciated.

Do you feel there has been a change in your ability to concentrate, perhaps either more deeply or for longer than before as a direct result of your eight-week mindfulness training? **YES / NOT REALLY/ NO**

If yes, please comment:

In the event that your concentration has been disrupted, do you feel you **now** have a greater ability (faster and more smoothly) to re-focus your attention back to the task at hand, as opposed to your ability pre mindfulness training? **YES / NOT REALLY/ NO**

Please comment:

As opposed to before the mindfulness workshop, do you feel you have a greater awareness of when your mind is wondering or not? **YES / NOT REALLY/ NO**

If yes, were you surprised how much your mind actually does wondered? **YES / NOT REALLY/ NO**

Please comment:

As opposed to before the mindfulness workshop, do you feel you have a greater ability to accept your thoughts and sensations in a non- judgmental and non-reactive way when they arise either before or while competing/training? **YES / NOT REALLY/ NO**
If yes, please comment:

Have you recently noted an increase in **flow** like moments while training or competing?
YES / NOT REALLY/ NO

If yes, do you feel it may have been facilitated by an ability to be mindful and accepting of thought and sensation and the ability to stay intentionally focused on the present moment experience?
If yes, please comment:

Score below the extent to which you feel you're cycling has benefited from practicing mindfulness.

0	1	2	3	4	5	6	7	8	9	10
No observed Benefit										Extremely beneficial

Please comment:

Please feel free to make any additional comments that you wish, they can relate to the running of the program, recommendation for future workshops or comments relating to your experiences throughout the eight weeks of training.

Thank you for your time