

***Underlying motives for activity: An agentic emotion regulation and attachment perspective.***

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**Declaration**

‘I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.

I confirm that I am submitting this work with the agreement of my Supervisor(s).’

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**Thesis Abstract**

In this thesis, through the lens of agentic emotion regulation theory (Woodman et al., 2010) and attachment theory (Barlow, 1969), we aimed to investigate the emotion regulation function that activities may serve.

Agentic emotion regulation theory provides an individual-differences perspective on participants’ psychological needs and motives for engaging in risk-taking activities (Woodman et al., 2010). According to agentic emotion regulation theory, high-risk activities provide greater opportunities to experience and control strong externally derived emotions, in which participants' agentic actions alter the nature of their emotions and life circumstances (i.e., success, injury, death). In this way, participating in high-risk activities, such as mountaineering, has been shown to reduce participants’ emotion regulation difficulties and bolster their sense of agency immediately after participation (Barlow et al., 2013). Despite these advancements, we do not understand how participants' agentic emotion regulation difficulties evolve between participation. Understanding the evolution of participants’ agentic emotion regulation between participation would help to explain the motives that underlie their repeated return to the high-risk sports domain.

Attachment theory (Bowlby, 1969) is another perspective on how our relationships with people, activities, and objects influence our emotion regulation strategies and wellbeing. Bowlby's (1980) attachment theory proposes that all individuals strive to maintain close relationships with agents that provide a safe haven from distress and secure base from which to explore. Researchers have begun expanding the scope of attachment theory by investigating the attachment emotion regulation function that nonhuman agents serve, such as pets and objects, in response to social insecurity (Keefer et al., 2014). Despite these advancements, discrepancies remain regarding the definition of genuine attachment relationships within this literature and there are scant empirical tools for measuring the attachment support that human-nonhuman relationships provide (Carr & Rockett, 2017). As such, there is ongoing debate regarding the attachment function that human-nonhuman relationships serve and their compensatory role in response to insecure social relationships (Keefer et al., 2014).

Chapter 1 outlines the agentic emotion regulation and attachment theory rationale on which Chapters 2, 3, and 4 are based.

In Chapter 2 of this thesis, we provide evidence that high-risk climbers, such as mountaineers and traditional climbers, are motivated by the agentic emotion regulation function that participation serves. Studies 1, 2, and 3 show that high-risk climbers experience a greater increase in agency and emotion regulation difficulty between participation than low-risk climbers (i.e., sport climbers) and low-risk sporting participants (e.g., swimming) who displayed no such difficulty. Collectively, these findings provide the first repeated-measures evidence that high-risk activities are beneficial for regulating participants' agentic emotion regulation difficulties.

In Chapter 3 (Study 4), we provide support for the attachment function that elite athletes’ activities serve. Specifically, our qualitative findings suggested that athletes sought their activities as a safe haven from their interpersonal and intrapersonal anxieties. Furthermore, these findings provide a novel insight into the emotion regulation processes that athletes’ activity attachments supported. That is, athletes’ activities provided a secure base from which to reflect and reappraise challenging emotions.

In Chapter 4 (Study 5) we first developed and provided support for the psychometric properties of the four-factor Relationship Attachment Support Scale and six-factor Relationship Exploratory Support Scale. Then, in Study 6, we provided support for the compensatory attachment role that activities serve in response to social insecurity. Specifically, the emotion regulation benefits of individuals’ activity attachments significantly attenuated the negative relationship between insecure social attachment and wellbeing. Collectively, these findings provide a preliminary insight into the emotion regulation processes and benefits of activity attachment, especially for those suffering from insecure social attachments. Chapter 5 of this thesis discusses the results from three empirical chapters (Chapters 2, 3, and 4) in a theoretical and applied context.

**Chapter 1 – General Introduction**

**Risk-taking: A human endeavour**

Traditionally, taking an optimal amount of risk has been advantageous and vital for species' health and development (Trimpop, 1994; Yates, 1992). However, the motives underlying unnecessary risk-taking have remained rather elusive (Lester, 1983; Lupton & Tulloch, 2002). In particular, identifying participants' motives for engaging in high-risk sporting activities is still proving problematic for researchers as they try to understand the rewards that underpin voluntary risking of one’s life (Woodman & Welch 2022).

From a psychodynamic perspective, voluntarily engaging in risk-taking activities, such as extreme sport, was initially seen as deviant, socially unacceptable, and pathological (Pain and Pain, 2005; Self et al., 2007). From a non-pathologizing perspective, Hebb (1955) suggested that the basic need for excitement and stimulation motived various voluntary risk-taking behaviours, such as high-speed driving. Hebb (1955) proposed that understanding Wilhelm Wundt's (1893, p. 250) assertion of optimal stimulation "is a phenomenon of the greatest importance for understanding motivation in higher animals". Research in the field of sensory deprivation has since emphasized humans' need for stimulation, from which Zuckerman's (1964) sensation seeking theory emerged (Hebb & Thompson, 1954; Hunt, 1963; Leuba, 1955).

**Sensation seeking theory**

In an effort to explain individuals' voluntary risk-taking motives, Zuckerman (1979) proposed the Sensation Seeking Theory. Specifically, Zuckerman (1979, p. 429) suggested that "every individual has a characteristic optimal level of stimulation (OLS) and arousal (OLA) for cognitive, motoric activity, and positive affective tone". Zuckerman (1994, p. 5) termed sensation seekers as individuals with a high OLA who are motivated to engage in “sensation seeking behaviours" to attain their OLA. According to Zuckerman (1994, p.27), "sensation seeking is a trait defined by varied, novel, complex and intense sensations and experiences, and the willingness to take physical, social, legal and financial risks for the sake of such experiences".

The applicationof Zuckerman's (1979) sensation seeking theory to explain purposeful risk-taking endeavors is unmatched, making this subject one of the most popular areas in psychology research (Llewellyn & Sanchez, 2008). The interpretation of this theory has been particularly influential in spreading the widely accepted narrative that all high-risk sports participants are sensation seekers, so-called adrenaline junkies (Zuckerman, 2007). Consequently, research investigating the motives underlying high-risk sports participation has become synonymous with Zuckerman, Eysenck, and Eysenck's (1978) Sensation Seeking Scale (SSS-V), despite no attempt by these authors to use their theory for such an intended purpose (see Barlow et al., 2013). Researchers' have further criticized this single-focused approach (Arnett, 1994; Barlow et al., 2013; Jackson & Maraun, 1996) because studies employing the SSS-V typically view all high-risk sports participants, regardless of discipline, as a homogeneous group of sensation seekers compared to low-risk takers (see Breivik, 1996; Kajtna et al., 2004; Zuckerman, 1994). Research indicates that the SSS-V has no explanatory value for high-risk sport motivation and is further unable to differentiate between different groups of high-risk sports participants, such as mountaineers and skydivers (Barlow et al., 2013; Castanier et al., 2010).

**The limitations of sensation seeking theory**

The dominant use of sensation seeking theory in risk-taking research has resulted in the oppressive narrative that all high-risk sports endeavors are motivated by sensation seeking, as indicated by elevated SSS-V scores (Zuckerman, 2007). Fortunately, the high-risk sports literature has evolved considerably, refuting this holistic sensation seeking explanation as this narrative fails to explain the motives reported by high-risk sports participants. Specifically, participants report that engaging in high-risk sports helps bolster their sense of physical and emotional control. Castanier et al., 2010; Lester, 2004; Woodman et al., 2020; Woodman et al., 2010). Importantly, Zuckerman (1979) developed the SSS-V to measure individuals' sensation seeking traits, not as a measure of motives. Most of the SSS-V items measure individuals' inclination to engage in activities that Zuckerman (1979) assumed to increase arousal, not their actual motives for such activities (Barlow et al., 2013). As a result, the SSS-V inability to differentiate motivational profiles across different high-risk sports disciplines is not surprising.

**Agentic emotion regulation theory**

In response to the limitations discussed above, Woodman, Hardy, Barlow, and Le Scanff (2010) developed the Agentic Emotion Regulation Theory to explain the motives that underlie participation in high-risk sports (such as mountaineering). *Emotion regulation* is a process that defines our attempts to influence which emotions we experience, when we experience them, and how we experience and express them (Gross, 2008). Individuals' perceived ability to exercise control over their beliefs, desires, intentions, and life circumstances forms their sense of agency (Bandura, 1989). Woodman and colleagues’ (2010) agentic emotion regulation theory suggests that high-risk sports provide greater opportunities to experience easily identifiable sources of anxiety, and regulating this anxiety improves individuals' sense of emotional control. In line with this notion, high-risk sports participants emphasized the challenges and rewards of regulating and controlling strong emotions derived from the physical dangers inherent in their sport, as failure to do so could result in life-threatening injuries (Barlow et al., 2015; Woodman et al., 2008). As such, the high-risk sports domain requires participants to act as an agent of their emotional and physical selves to mitigate life-threatening situations (Barlow et al., 2013; Woodman, Huggins, Le Scanff & Cazenave, 2009). High-risk sports participants report that these agentic emotion regulation opportunities are not available in daily life, in which external forces primarily dictate their physical and emotional experiences (e.g., social relationships and work, Lester, 2004; Woodman et al., 2010).

**Agentic emotion regulation research in high-risk sport**

Woodman and colleagues' (2010) empirical findings confirmed the observations of others, demonstrating that expeditionary high-risk sport participants experience greater difficulty regulating their emotions and sense of agency in domestic life (Fave, Bassi & Massimini, 2003; Leon, McNally, Porath, 1989; Lester, 1983, 2004). Specifically, Woodman et al. found that trans-Atlantic rowers and mountaineers displayed significantly greater *difficulty describing their feelings* than controls, and mountaineers displayed lower agency levels in romantic relationships than controls. On completion of their arduous crossing, trans-Atlantic rowers gleaned an agentic emotion regulation benefit regarding their sense of agency and ability to identify and express emotions in their most intimate relationships. These findings signify the agentic emotion regulation function that high-risk sports may serve. Hampered by the lack of direct domain-specific measures of emotion regulation and agency (e.g., alexithymia and spheres of control scales), Woodman and colleagues (2010) drew tentative conclusions from their results.

In response to these methodological limitations, Barlow et al. (2013) developed the Sensation Seeking, Emotion Regulation, and Agency Scale (SEAS). The SEAS enabled researchers to explore different motives underlying high-risk sports engagement and the agentic emotion regulation and sensation seeking function that participation may serve (Woodman et al., 2020). Using the SEAS, Barlow and colleagues (2013) identified that skydivers were predominantly motivated by sensation seeking, while mountaineers sought to fulfil their greater agentic emotion regulation needs. The agentic emotion regulation benefits mountaineers experienced in their activity also transferred into their everyday lives. Additionally, the motivational profiles of mountaineers and low-risk sports participants before, during, and immediately after participation was not associated with sensation seeking. These results further debunk the traditional sensation seeking narrative by identifying distinct motivational profiles across different high-risk sports (in this case, skydivers and mountaineers). These findings are consistent with Woodman and colleagues’ (2020) findings in which traditional rock climbers experienced a self-esteem benefit via the agentic emotion regulation function that climbing serves. Specifically, traditional rock climbers (i.e., a high-risk form of climbing) reported experiencing greater agentic emotion regulation during participation, reduced difficulty regulating emotions post participation, and higher self-esteem than their low-risk sports counterparts (e.g., runners). These results suggest that activities that exercise a high level of agentic emotion regulation also led to elevated self-esteem (see Woodman et al., 2020).

**Objective of the present research**

Although the picture has become clearer concerning the diverse motives for engaging in high-risk sports and their immediate positive effects (see Barlow et al., 2013; Woodman et al., 2010, Woodman et al., 2020), we know nothing of the process thereafter. In other words, although we understand that some high-risk sporting participants experience an agentic emotion regulation benefit from their activity, we do not understand how these benefits evolve over time. Specifically, understanding participants' agentic emotion regulation difficulties in the time after participation may help to explain the underlying motives for repeatedly returning to the high-risk sports domain. Thus, the aim of Chapter 2 is to investigate high-risk climbers’ agentic emotion regulation profiles post-participation.

**Attachment relationships**

*“For to have a deep attachment for a person (or a place or thing) is to have taken them as the terminating object of our instinctual responses”* (Bowlby, 1969, p. 13).

Personality and social psychology researchers have sought to understand the underlying constructs that shape human behaviour (e.g., Bandura, 1986; Bowlby, 1969; Deci and Ryan, 1985; Eysenck, 2012; Zuckerman,1979). To that end, researchers have proposed psychological and social need theories that go some way to explain peoples' underlying motivations and behaviours. Since understanding psychological needs help us explain human behaviour and improve healthy functioning, the area of psychological needs has received considerable attention (Gopalan et al., 2017; Sheldon, Elliot, Kim, & Kasser, 2001). Philosophers and researchers have reported the importance of healthy interpersonal relationships for regulating individuals' basic psychological needs since Aristotle's work on relational 'philia' (4th century; Konstan, 1996) to the emergence of modern relational theories (Bowlby, 1969; Deci & Ryan, 1985; Maslow, 1943; Vygotsky, 1987). For example, Lev Vygotsky’s (1987) social development theory stressed the importance of social interaction for cognitive development. Individuals' need for relatedness forms one of three basic needs proposed by Deci and Ryan's (1985) self-determination theory. Furthermore, Maslow's (1943) hierarchy of needs acknowledged individuals' need for interpersonal love and a sense of belonging.

Bowlby (1969) and Ainsworth (1985) provided one of the most influential and important contributions to the study of basic human needs by describing a series of innate relational needs that support healthy development and wellbeing. Bowlby's (1969, 1973, 1980) trilogy of papers specifying the tenets of attachment theory and Ainsworth’s (Ainsworth & Bell, 1969) empirical methodologies revolutionized our perspective on intimate social relationships and the fundamental functions that they serve. Specifically, healthy attachment relationships provide a *safe haven* from distress and a *secure base* from which to explore and develop (Bowlby, 1973). Furthermore, Bowlby (1980) suggested that satisfying individuals’ attachment needs is the first step in enabling optimal development, wellbeing, and interpersonal and intrapersonal emotional functioning.

The majority of relational research has focused on the interplay between human relationships, their characteristics, and their impact on our lives (Goldberg, Muir, & Kerr, 2013). In recent years, theorists and researchers have begun investigating the scope of attachment theory for enriching our understanding of human-nonhuman relationships (Keefer, Landau, & Sullivan, 2014). This research suggests that individuals develop attachment relationships with nonhuman agents, such as pets, as a compensatory response to insecure social relationships (Carr & Rockett, 2017). Empirical evidence has supported Bowlby’s (1969, p. 13) notion that individuals can develop “a deep attachment for a person (or a place or thing)”in service of their attachment needs (Beck & McDonald, 2004; Keefer & Rothschild, 2020; Kwong & Bartholomew, 2011).Accordingly, the relationships that we develop with nonhuman agents, such as pets, objects, and deities, are considered to play an important role in supporting healthy emotional functioning, wellbeing, and development (Keefer et al., 2014).

**Attachment Theory**

Research has well-established the importance of secure attachment relationships for enhancing development and psychological wellbeing (Mikulincer & Shaver, 2016). Bowlby’s (1969) attachment theory suggests the underlying processes that determine the interplay between attachment and wellbeing lie with the basic attachment functions relationships support. Specifically, Bowlby (1980) suggests that humans are inherently motivated to seek others who can help regulate feelings of insecurity by providing a *safe haven* and acting as a *secure base* from which to explore. The safe haven and secure base attachment function relationships serve support distinct behaviors that underpin Bowlby’s (1969) notion of an attachment and exploratory behavioural system. Specifically, the attachment behavioural system activates proximity-seeking behavior towards others who can prove a safe haven from distress. The exploratory behavioural system is activated when individuals explore their internal and external world with the security of others' support. Research suggests that the safe haven support individuals receive in close interpersonal relationships (attachment system) dramatically influences individuals' exploratory behaviors in pursuit of stimulation and learning (exploratory system; Elliot & Reis, 2003; Feeney & Van Vleet, 2010).

Over half a century of relational research has highlighted the importance of having available, responsive, and supportive attachment figures that promote healthy attachment and exploratory behaviors (Mikulincer & Shaver, 2016). *Secure attachments* provide a solid foundation for individuals' psychological wellbeing and development by supporting their needs for security and personal growth (Shaver & Mikulincer, 2002). These interactions reduce individuals’ social uncertainty by forming positive beliefs and expectations that others are helpful, the world is somewhat safe, and can be explored (Bowlby, 1969). Bowlby (1988) deemed these early experiences as the building blocks that form individuals' mental representations of themselves and others, referring to these representations as *internal working models* (IWM) or attachment styles. Our attachment styles play an essential role in how we behave in close relationships, as they reflect our beliefs about others' ability to meet our needs for security and whether we deserve support (Bowlby, 1973). Thus, when we experience others as unsupportive, this can influence our relational expectations and self-beliefs (Bowlby, 1980). For example, individuals suffering from unsupportive social relationships may feel that they cannot trust others for support and are not worthy of care (Bowlby, 1973). Anxious and avoidant attachment styles represent two forms of insecure attachment beliefs and are associated with maladaptive emotion regulation strategies, such as hyperactivation and suppression, and poorer wellbeing in contrast to secure attachment relationships (Fraley & Shaver, 2000). *Avoidantly attached* individuals tend to avoid emotionally intimate relationships as they question others' intent and support, deactivating their attachment system to maintain behavioural independence (Cassidy & Kobak, 1988). *Anxiously attached* individuals hyperactivate their attachment system, displaying clinging behaviors to reduce their concerns of being abandoned or rejected (Collins & Read, 1990).

**Attachment and emotion regulation**

Attachment styles serve a proactive function by shaping how we evaluate, appraise, and behave in new relationships, which may reshape or solidify our current relational expectations and behaviors (Collin & Read, 1990). In this regard, Bowlby (1969, 1973, 1980) argued that attachment styles influence our behavior in future relationships and our interpersonal and intrapersonal emotion regulation strategies.

This assertion is consistent with recent research findings in which attachment styles can explain stable differences in individuals’ interpersonal behavior and emotion regulation strategies (Mikulincer & Shaver, 2016, 2019). In this literature, two attachment-related emotion regulation strategies have emerged in the form of secure primary and insecure secondary attachment strategies (Mikulincer et al., 2003). Primary attachment strategies involve seeking secure attachment bonds to experience, perceive freely, express, and reappraise negative affective experiences and are associated with greater wellbeing (Mikulincer & Shaver 2016). Secondary attachment strategies consist of hyperactivating and deactivating strategies that are detrimental to one's wellbeing, as they deny individuals of secure intimate relationships (Cassidy & Kobak, 1988). Anxiously attached individuals hope to increase the intimacy and intensity of their interactions with others by using hyperactivating strategies to upregulate negative emotions (e.g., focussing on stressful thoughts and events, Mikulincer and Florian 1995). Avoidantly attached individuals typically use deactivating strategies, such as suppression and denial, to conceal their emotional experiences to avoid relational intimacy and interpersonal dependence (Mikulincer et al., 2000). Recent research suggests that the emotion regulation strategies that individuals' relationships support mediate the relationship between attachment orientation and wellbeing (Brandao et al., 2019). In this way, the emotion regulation function that attachment relationships serve is particularly important in supporting individuals' wellbeing (Karreman & Vingerhoets, 2012; Malik, Wells, & Wittkowski, 2015).

**The stability of attachment orientations**

Since the notion of *attachment styles*, research has provided empirical support for the stability and malleability of individuals’ attachment styles across different relationships (Collins & Read, 1990). Earlier accounts describe individuals' attachment styles as relatively general, stable, and trait-like (Ainsworth, 1989). However, over the past fifty years research has evolved considerably, supporting the assertion that individuals' attachment beliefs, expectations, and behaviours (e.g., IWMs) can vary greatly from one relationship to the next (Fraley, Heffernan, & Vicary, 2011; Fraley & Roisman, 2019). Understanding the relative security of individuals' interpersonal relationships may help to explain why people develop compensatory attachment relationships with nonhuman agents.

**Nonhuman attachments as a compensatory relationship**

*“Surely, it's not simply for the rush, the quick-fix, the lustful high? It's more of a love, one that forgives the arguments, the 117 mistakes, the lows, the absences”* (Sophie Wynne-Jones, Return to climbing, 2010, p. 74)*.*

Not long after the conception of attachment theory, Bowlby (1980) suggested that infants may seek a favorite blanket as a compensatory response to unavailable parental figures. In this way, nonhuman agents can play a compensatory role in regulating distressing emotions when social relationships fall short. Research has since used attachment theory as a lens through which to explore human-nonhuman relationships. Empirical findings indicate that “nonhuman targets can serve the same safe-haven and secure base roles traditionally reversed for human agents” (Keefer et al., 2014, p. 525).

With Bowlby’s (1980) compensatory notion in mind, Carr and Rocket (2017) identified that children in long-term foster care used animal companions as an important source of reassurance and comfort. These interviews revealed that the children’s companion animals, such as dogs, acted as attachment figures in their own right by providing a safe haven from distress and security when exploring in lieu of human agents. Keefer and colleagues (2012) findings supported the compensatory role object attachments served by providing an alternative source of security for individuals with insecure social relationships. Building on this work, Keefer and Rothschild (2020) recently identified that object attachment can attenuate the negative effects of insecure social attachments by bolstering one’s sense of control and wellbeing. They suggested that nonhuman agents' passive and controllable nature underlies the sense of security that they provide to individuals. Thus, although nonhuman agents lack the verbal or physical support that social relationships provide, their passive nature and unconditional support make them ideal agents for safeguarding individuals' needs for security (Feeney, 2004; Greenwood & Long, 2009; Sable, 2013). Furthermore, nonphysical agents such as gods and fictional characters have been shown to bolster one's sense of belonging by relieving feelings of loneliness and distress in response to social insecurity (Derrick, Gabriel, & Hugenberg, 2009; Granqvist & Hagekull, 1999). These findings suggest that physical and verbal support is not necessary for regulating one's secure base and safe haven attachment needs.

Collectively, these findings suggest that when individuals view their relationships as unreliable and unsupportive, this insecurity may provide the conditions under which human-nonhuman attachments thrive. Specifically, if individuals feel insecure in their physical and verbal interactions with others, they may compensate for this insecurity by approaching more passive nonhuman agents for attachment support (Carr & Rocket, 2014). Indeed, if individuals develop attachment relationships with nonhuman agents to compensate for social insecurity, these relationships may have significant therapeutic value for those suffering from loneliness and interpersonal insecurity.

**Attachment to activity**

 Although research has broadened the horizon of attachment theory, investigating the attachment bonds individuals may develop with their physical activities, such as sporting activity, remains relatively unexplored. Historically the application of attachment theory in sporting activity has almost exclusively investigated interpersonal relationships, such as parents, friends, coaches, and team members, and their influence on sporting wellbeing, health, commitment, goal achievement, motivation, and performance (Adams & Carr, 2019; Carr, 2009; Felton & Jowett, 2017; Weiss & Smith, 2002). Since Wylleman (2000) highlighted the field of interpersonal relationships as 'uncharted territory' in sport psychology, the past 20 years of research has helped bridge the gap (Carr, 2013). However, investigating the attachment function physical activities might serve in their own right remains uncharted. Similar to relations with nonphysical agents, such as those individuals share with deities (Beck & McDonald, 2004; Willard, 1984), the process by which activities act as an attachment agent may reside in their ability to provide an emotional safe house from which to regulate or escape distressing emotions and to feel secure. There are numerous accounts of individuals describing their feelings towards their activities that indicate such a relational nature. We review these accounts below.

**Anthropomorphism**

Understanding the transference of attachment from human to nonhuman agents is somewhat facilitated through the concept of anthropomorphism. Anthropomorphic tendencies develop early in life when children project human-like qualities onto objects, such as a favourite teddy or blanket to meet their attachment needs when parents are regularly unavailable (Gjersoe, Hall, & Hood, 2015).

Although not empirically tested, individuals' recollective accounts of their sporting activities suggest that they may anthropomorphize their activities to facilitate a sense of belonging (Lester, 2004). Lionel Terray (1964, p.56), one of the best climbers of his time, poetically summarised this process by stating “I began to realize that the mountain is no more than an indifferent wasteland of rock and ice with no other value than what we choose to give it, but that on this infinitely virgin material each man could mould, by the creative force of the spirit, the form of his own ideal”. Renowned mountaineer Reinhold Messner described how mountaineering facilitates a sense of belonging by allowing him to “limb out of a sea of loneliness and into the safety of the universe” (Lester, 2004, p. 148). Others have described the affective component of their sporting relationships, such as Stephens (1994, p. 35), who reported that she had fallen in love with the mountains and described herself as having “a long-running affair with Kenya . . .”.

The interpersonal relational language used in these individuals' accounts is consistent with Epley, Waytz, and Cacioppo's (2007) three-factor model of anthropomorphism. That is, individuals anthropomorphize nonhuman agents to glean a sense of familiarity, agency, and affiliation. Thus, one may speculate that individuals anthropomorphize their activity relationships to facilitate the attachment function they serve (Keefer, 2016). Despite these accounts, more research is needed to investigate whether people’s activity relationships serve a genuine attachment function.

**Limitations underlying nonhuman attachment research**

Despite the evidence supporting the compensatory attachment roles of nonhuman agents, theoretical inconsistencies remain in the ideas, perceptions, and definitions that underlie genuine attachment bonds (Beck & Madresh, 2008). For example, research investigating human-nonhuman relationships has used the term *attachment* to describe a general emotional bond or connection (Beck & Madresh, 2008; George et al., 1998). Consequently, this research has not investigated the fundamental behaviours that underpin Bowlby's (1980) conceptualization of an attachment bond. Specifically, research suggests that attachment relationships should provide a *safe haven* in distressing times, a *secure base* from which to explore, elicit *proximity maintenance* behaviours for assurance and enjoyment, and derive *separation anxiety* in concern for ones’ wellbeing (Haven and Zeifman, 1994). Researchers should use this clear taxonomy of behaviours to assess and identify genuine attachment relationships (Haven & Zeifman, 1994). Further to this, researchers have generally investigated individuals’ anxious and avoidant beliefs towards nonhuman agents (i.e., I can count on my dog's trustworthiness, Kurdek, 2008) rather than exploring the attachment support nonhuman agents provide. The absence of any attachment support scales in the existing literature has hampered our understanding of human-nonhuman attachments and their compensatory role in response to social insecurity. Thus, developing phenomenologically-informed attachment measures would shed light on the attachment function human-nonhuman relationships serve.

**Objective of the present research**

Although empirical evidence has brought to light the compensatory attachment roles that nonhuman agents can serve (Keefer et al., 2014), research has not yet fully explored the boundaries of attachment theory in improving our understanding of human-activity relationships. Specifically, we do not understand the interplay between individuals’ attachment needs and the regulatory function that activities may play in fulfilling those needs. Thus, understanding the attachment support individuals glean from activity participation may help to explain individuals’ motives for engaging in their activities, particularly for those individuals suffering from social insecurity. Thus, in Chapters 4 and 5 we aimed to investigate the attachment function that individuals' activities serve and their compensatory role in response to social insecurity.

**Thesis structure**

 This thesis consists of a general introduction, three empirical chapters (Chapters 2, 3, and 4), and a general discussion. The empirical chapters have been prepared for submission to academic journals as standalone papers. As such, there is some unavoidable repetition in explaining the theoretical grounds for these papers.

Chapter 1 introduced the agentic emotion regulation theory (Woodman et al., 2010) and attachment theory (Bowlby, 1969) as fruitful frameworks for understanding individuals' motives for engaging in physical activity. Research exploring the agentic emotion regulation function activities serve supported the suggestion that high-risk sporting participants’, such as mountaineers, display different agentic emotion regulation profiles *before*, *during*, and immediately *after* participation compared to low-risk sports participants, such as runners. However, no research has investigated participants' agentic emotion regulation profiles in the time *between* participation. Thus, investigating participants' agentic emotion regulation difficulties between participation as an indicator of their motives for participation was deemed worthy of further investigation. Researchers have become increasingly interested in the attachment function nonhuman agents serve, such as pets, deities, and objects, in lieu of secure social relationships (Keefer et al., 2014). However, research has not yet extended the scope of attachment theory into the field of human-activity relationships. Thus, the potential compensatory attachment activities serve in buffering against social insecurity appears worthy of investigation.

In Chapter 2 we tested the agentic emotion regulation hypothesis in a population of high-risk climbers, such as traditional climbers, and low-risk sports participants, such as sport climbers and runners. Specifically, across three studies, high-risk climbers experienced greater agentic emotion regulation difficulty between participation than low-risk sports participants. These findings support our hypothesis and the agentic emotion regulation motives underlying high-risk climbing participation.

In Chapter 3 we explored the attachment function athletes’ activities served. Specifically, in Study 4 we conducted in-depth interviews with elite athletes and provided preliminary insight into the attachment role activities serve and their underlying emotion regulation processes. Specifically, athletes’ activities provide a safe haven from which they could reflect and reappraise their interpersonal and intrapersonal anxieties. We then discuss the theoretical and applied implication of the study.

 In Chapter 4 we investigated the compensatory attachment hypothesis. Specifically, we tested the moderation hypothesis that activity attachments will attenuate the negative relationship between insecure interpersonal attachment and wellbeing (Study 6). However, due to a lack of suitable measures in the existing literature, the initial task was to develop scales capable of measuring the attachment and exploratory support that participants' activity relationships might provide (Study 5). These studies provided preliminary support for the psychometric properties of the newly developed attachment scales and the compensatory hypothesis. The methodological and applied implications of the two studies are then discussed.

Chapter 5 summarises the main findings from the research chapters and discusses the strength and limitations of the thesis. Finally, the research implications and future research directions are developed and summarized in a broad theoretical and applied context.

**Chapter 2: Agentic emotion regulation in high-risk sport: An in-depth analysis across climbing disciplines[[1]](#footnote-1)**

**Abstract**

Research has now debunked the standpoint that high-risk sports participants are a homogenous group of sensation seekers (i.e., Barlow et al., 2013); the process of agentic emotion regulation is a primary motive for high-engagement high-risk sports (i.e., mountaineering). The evidence, however, remains cross-sectional, and there is currently no evidence to support the timeline of this process. We aimed to bridge that gap by investigating the process of agentic emotion regulation difficulty over three post-participation time points across different disciplines of climbing that vary in risk and objective danger. Emotion regulation is the process by which individuals alter the nature, intensity, and duration of their emotions (Gross, 2008). Agency refers to individuals' perceived control over their internal beliefs, desires, intentions, and actions (Bandura, 1997). The results from two retrospective (*n* = 161, *n* = 134) and one longitudinal (*n* = 45) study revealed that those who engage in high-risk forms of climbing (i.e., traditional climbing) experience a greater increase in agency and emotion regulation difficulty after participation than individuals who participate in lower-risk forms of climbing (i.e., sport climbers) and other relatively low-risk sports (i.e., swimming). This research supports the benefits of high-risk activities for regulating participants' agentic emotion regulation difficulties.

**Introduction**

High-risk sports are psychologically captivating because participants appear to risk their lives for the sake of it, and the motive that might underlie such activities has remained rather elusive (Barlow et al., 2013). Despite the risks, or perhaps because of the risks, in contrast to what some perceive as an ever-increasing sanitization of society (Woodman, Hardy, & Barlow, 2020), participation in high-risk sports such as white-water kayaking, rock climbing, and skydiving is increasing (Thorpe & Dumont, 2018).We use the term *high-risk sports* to define sports where the possibility of severe injury or death is inherent in the activity in the event of mismanagement or something going awry (Cohen et al., 2018; Windsor et al., 2009). Sports widely considered high-risk sports include BASE (Building, Antennae, Space, Earth) jumping, traditional rock climbing, and mountaineering (Cohen et al., 2018).

The high-risk sports literature has evolved considerably beyond simplistic interpretations of Zuckerman's (1979) Sensation Seeking Theory. The Agentic Emotion Regulation Theory is one such example (Barlow et al., 2013). Despite these advances, there is a lack of literature on the specific evolution of the agentic emotion regulation motivation that leads individuals to return to these activities. This paper aims to bridge that gap by exploring the high-risk sports individuals' post-activity timeline of agentic emotion regulation to further our understanding of the underlying motivation for high-risk sports.

**Adrenaline junkie - The traditional high-risk sports perspective**

Over the past sixty years, researchers have developed several theories to explain participants' motives for engaging in high-risk endeavors. Zuckerman’s (1964) sensation seeking theory has been the most influential in developing the traditional high-risk sports sensation seeker/adrenaline junkie narrative, which has been widely accepted in the general population (Llewellyn & Sanchez, 2008; Maher, 2015). According to Zuckerman (1994, p. 27), “sensation seeking is a trait defined by varied, novel, complex and intense sensations and experiences, and the willingness to take physical, social, legal and financial risks for the sake of such experience”.

**Limitation of the sensation seeking view for understanding the motives for high-risk sports**

Research on the motives underlying high-risk sports participation as measured by Zuckerman, Eysenck, and Eysenck’s (1978) Sensation Seeking Scale (SSS-V) has typically viewed participants through the single-focus lens of sensation seeking. Some high-risk sport participants (i.e., skydivers) have reported moments of intense stimulation and arousal in their activity, and the literature and media have perpetuated the narrative that high-risk sport participants are a homogenous group of sensation seekers (see Breivik, 1996; Horvath & Zuckerman, 1993; Zuckerman, 1994, 2007). These conclusions are flawed, however, because such a view runs counter to the motives reported by other high-sport sporting participants, such as mountaineers and trans-ocean rowers (experience of emotional and physical agency, Castanier et al., 2010; Lester, 2004; Woodman et al., 2010) and importantly because the SSS-V was never intended to be used as a measure of motives for high-risk sport (see Barlow et al., 2013). Specifically, Zuckerman (1979) developed the SSS-V to measure individuals’ sensation seeking traits, not as a measure of the motives underlying risk-taking behaviors. Zuckerman (1979, p. 165) stated, “most of the items express the preference or desire to engage in certain kinds of behavior”. That is, the SSS-V measures individuals’ propensity to engage in activities that Zuckerman assumed to increase stimulation and arousal, not their motivation for such activities. Thus, the SSS-V’s inability to discriminate risk-taking motives across different high-risk sports is unsurprising (Zarevski et al., 1998; Zuckerman, 2007).

**Agentic Emotion Regulation theor**y

Woodman, Hardy, Barlow and Le Scanff (2010) developed Agentic Emotion Regulation theory to explain the motives that might underpin participation in high-engagement high-risk sports (such as mountaineering and trans-ocean rowing, which require considerable planning and preparation). Emotion regulation is the process by which individuals’ actions alter the emotions that they experience, when they experience them, and how they experience and express them (Gross, 2008). Agentic Emotion Regulation theory proposes that some high-risk sports provide the opportunity to experience external and easily identifiable sources of anxiety, and overcoming this anxiety helps bolster participants’ sense of emotional control (Woodman et al., 2008; Woodman et al., 2009). The physical dangers implicit in high-risk activities require individuals to exercise a variety of antecedent and response-based emotion regulation strategies(Gross, 2008) to manage strong emotions; failure to do so can have life-threatening consequences (Barlow et al., 2015; Breivik, 2010). Another facet of Agentic Emotion Regulation theory is agency. Agentic people intentionally influence their development and life circumstances (Bandura, 1997). The most fundamental mechanism of agency is individuals’ perception of their ability to exercise control over important events in their life, in which they are in control of their internal beliefs, desires, and intent (Bandura, 1997). In contrast to the decisions made in domestic life, high-risk sports participants are often making decisions that will determine whether they live or die (Woodman et al., 2009). Thus, the high-risk sports domain requires a great deal of physical and emotional control to manage these risks. Participants report that only engaging in high-risk sport provides the opportunity to manage these physical and emotional challenges and meet their agentic emotion regulation expectations (Barlow et al., 2013; Woodman et al., 2010). Lester (2004) suggested that these experiences are perceived as not being readily available in daily life, in which individuals (i.e., mountaineers) perceive that their circumstances and emotional experiences are dictated and driven by forces outside of their control.

Woodman et al. (2010) found that expeditionary high-risk sports participants, such as mountaineers and trans-Atlantic rowers, displayed a greater difficulty regulating their emotions and a depleted sense of agency in daily life. Specifically, mountaineers displayed lower agency in loving relationships and a greater difficulty describing their feelings in daily life compared to controls (i.e., non-mountaineering participants). trans-Atlantic rowers' experiences support the notion that emotional difficulties may motivate high-risk sports engagement. On completion of their expedition, trans-Atlantic rowers displayed an increase in their perceived interpersonal control and in their ability to identify and express emotions within their most difficult interpersonal relationships. trans-Atlantic rowers' post participation experience speaks to an agentic emotion regulation transfer benefit from their sporting to interpersonal domain. These findings illuminate the agentic emotion regulation affordances of the high-risk sport domain and the regulatory function that participation therein may serve.

Within this agentic emotion regulation framework, Barlow et al. (2013) developed the Sensation Seeking, Emotion Regulation and Agency Scale (SEAS), which allows researchers to explore different motives for engaging in high-risk activities. Using the SEAS, they revealed that mountaineers were predominantly motivated by agentic emotion regulation and that skydivers were motivated by sensation seeking. Additionally, mountaineers and controls displayed no differences in any sensation seeking factors, further refuting the universal sensation seeking view of high-risk sport participants. Importantly, only the mountaineers experienced positive emotion regulation and agency transfer effect from the mountaineering domain back into aspects of everyday life.

**Purpose of the present research**

Although research has identified that high-risk sports participants can derive immediate agentic emotion regulation benefits from participation and transfer these benefits back into their daily life (see Barlow et al., 2013; Woodman et al., 2010), we know nothing about the process of agentic emotion regulation thereafter. In short, although we understand that some high-risk sports participants derive an agentic emotion regulation benefit from their activity, we do not understand how their agentic emotion regulation difficulty evolves over time after participation. Such an understanding would go some way to explaining the motive that underlies the repeated return to the danger of the high-risk domain. The purpose of the present research was to begin to address this gap and to investigate the relative decay of the agentic emotion regulation benefits derived from one’s activity. Studies 1 and 2 aimed to provide a retrospective account of any differences between high-risk climbers (mountaineers, traditional climbers) and low-risk sport (sport climbing, bouldering, hiking, swimming) participants’ agency and emotion regulation difficulty post-participation. In Study 3, the national lockdown laws to control the COVID-19 pandemic resulted in individuals being temporarily unable to participate in their activity, which is unusual for many avid participants. This scenario provided an opportunity to measure post-participation emotional regulation and agency difficulty in real-time (i.e., longitudinally). Further to this, we also aimed to refute Zuckerman's (2007) high-risk sports sensation seeking narrative by demonstrating that high-risk climbers' and low-risk sporting participants' sensation need satisfaction would not increase post participation. Thus, supporting the notion that these groups are not motivated by the sensation function of their sporting activity (Barlow et al., 2013). To that end, this paper aimed to test the following hypothesis across all three studies.

**Agency and emotion regulation hypothesis**

Unlike low-risk sporting participants, high-risk climbers are motivated by the emotion regulation and agency function of participation. Specifically, we hypothesized that only high-risk climbers’ (i.e., mountaineers, traditional climbers) *difficulty with emotion regulation and agency* would significantly increase in the time between participation, with no such increase for low-risk climbers (i.e., sport climbers) and low-risk sport controls.

**Sensation seeking hypothesis**

High-risk climbers and low-risk sporting participants are not motivated by the sensation need satisfaction function of participation. Specifically, both high-risk climbers’ (i.e., mountaineers, traditional climbers) and low-risk sporting participants (i.e., sport climbers, runners) *sensation* *need satisfaction* will not significantly increase in the time between participation.

**Study 1**

 The aim of Study 1 was to explore the retrospective sensation need satisfaction, emotion regulation, and agency difficulties of high-risk climbers (i.e., traditional climbers and mountaineers), relatively low-risk climbers (i.e., sport climbers), and low-risk sport controls (i.e., hikers, swimmers, golfers, cyclists) one day, one week, and six weeks after participation in their respective sporting activities. We selected these groups to allow us to investigate the sensation need satisfaction, emotion regulation, and agency difficulty of high-risk climbers between participation while controlling for environmental (sport climbing in mountainous natural environments) and physical (physicality of low-risk sport) factors. Observing an increase in high-risk climbers’ agency and emotion regulation difficulty and sensation need satisfaction between participation would speak to the regulatory function that their sport serves. In contrast, finding no change in agentic emotion regulation difficulty or sensation need satisfaction between participation would suggest that participants do not engage in their sport to regulate their sense of agentic emotion regulation (i.e., low-risk sports participants) or fulfil their sensation seeking needs.

**Methods**

**Participants**

We conducted a priori power analysis using G\*Power analysis (Faul et al., 2007) for testing a 3 (time) × 4 (group) mixed-model ANOVA with a small effect size (*ηp2*=.02) and an alpha level of .05. The results showed that a total sample size of 116 would be required to achieve a power of .80. We recruited 161 participants from various sporting activities (mountaineering, traditional rock climbing, sport climbing, golf, squash, swimming, cycling, rowing) through online advertisement. In this study, there was no missing data from this sample.

**High-risk climbing groups**

*Mountaineers* were individuals who stated that mountaineering was their preferred sport and who reported being intermediate to expert. Thirty-two participants met these criteria (27 men, 5 women; *M*age *=* 38.41, *SD =* 16.02; *M*years of participation = 16.34, *SD* = 14.55). Mountaineering most often involves an attempt to reach a high point in remote mountainous terrain, which can require days, weeks, or months of walking and climbing, typically with no external aid. The dangers include avalanches, rock fall, falling (i.e., off a mountain face, into a crevasse), hypothermia, and frostbite, all of which can result in serious injury or death (Schoffl et al., 2012).

*Traditional rock climbers* were individuals who stated that traditional climbing was their preferred sport and reported being intermediate to expert. Fifty-eight participants met these criteria (49 men, 9 women; *M*age*=* 33.54, *SD =* 17.20; *M*years of participation= 14.35, *SD* = 15.78). Traditional rock climbing is one of the most dangerous climbing disciplines (Schoffl et al., 2012). Traditional climbing involves climbing outdoor rock faces and placing unfixed anchors and protection into cracks in the rock. If climbers fall and this protection fails, they will fall until the next piece of protection, which may fail due to the dynamic load placed upon that protection. As the protection is not fixed to the rock, the risk of severe injury or death is omnipresent (Schoffl et al., 2012).

**Low-risk climbing group**

*Sport climbers* were individuals who stated that sport climbing was their preferred sport and did not participate in traditional climbing or mountaineering as a secondary sport. Twenty-one participants met these criteria (13 men, 8 women; *M*age*=* 34.00, *SD =* 13.09; *M*years of participation= 9.38, *SD* = 7.15). Sport climbing involves climbing rock faces or artificial indoor climbing walls with fixed protection bolts in the rock/wall and requires no self-placed unfixed protection. Lead climbers may fall twice the distance of the previously fixed protection that they clipped into, but the risk of the fixed protection bolts failing in the event of a fall is extremely low. Due to the security of these fixed bolts, sport climbing poses minimal risk of severe injury and is a low-risk activity (Schoffl et al., 2012).

**Low-risk sport controls**

*Low-risk sport control* were individuals who participated in various low-risk sporting activities (such as hiking, golf, squash, swimming, cycling, rowing) and did not participate in any high-risk sporting activities. Fifty participants met these criteria (25 men, 26 women; *M*age*=* 32.78, *SD =* 13.99; *M*years of participation = 16.60, *SD* = 12.57).

**Measures**

We used the between-participation Sensation Seeking, Emotion Regulation and Agency Scale (SEAS) consisting of six sensation seeking items (i.e., *I look forward to getting a physical thrill from participating*), six emotion regulation items (i.e., *The emotional elements of my life are difficult to deal with*) and six agency items (i.e., *I feel like people or circumstances are trying to impose limits on me*, Barlow et al., 2013). Participants responded on a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

We asked participants to complete three different between-participation SEAS, by adopting the mindset of being absent from their sport for one day (Time 1), one week (Time 2), and six weeks (Time 3). These timeframes allowed us to measure the sensation seeking, emotion regulation, and agency fluctuation that participants experience after bouts of participation (Barlow et al., 2013). This design allowed us to capture any increased difficulty as a function of time since their last participation (see Barlow et al., 2013; Castanier et al., 2010, 2011; Woodman et al., 2009, 2010). Specifically, participants received the following introductions for each of the between-participation SEAS: Time 1, *Please answer the following statements thinking about your feeling toward your life the day after participating in your preferred sport or activity*; Time 2, *Please answer the following statements thinking about your feeling towards your life the week after participating in your preferred sport or activity*; Time 3, *Please answer the following statements thinking about your feeling towards your life six weeks after participating in your preferred sport or activity*.

[[2]](#footnote-2)Given the modification to the opening instructions to the SEAS, we sought to ensure that we retained the internal consistency of the scale. To that end, we tested the reliability of this version of the SEAS using Hayes and Coutts (2020) SPSS OMEGA macro. McDonald’s omega and Cronbach’s alphas demonstrated very good reliability for all the SEAS 6-item factors across all three time points (see Table 1).

**Procedure**

We provided a URL link that directed participants to the welcome page, informing them of the nature of the study and the data confidentiality and protection regulations in place. Participants provided informed consent and demographic information before completing the study measures; they were opted into a £100 prize draw on completion of the survey. The institutional ethics committee granted ethical approval.

**Analysis strategy**

We conducted statistical analyses in this paper using SPSS (IBM, Armonk, NY). Using SPSS, we explored the hypothesized time × group interaction on emotion regulation difficulty, agency difficulty and sensation need satisfaction. Specifically, we conducted a time × group mixed-model ANOVA for each of the SEAS factors and explored significant interactions using repeated measures ANOVA and one way ANOVA follow up tests. This method allowed us to identify differences between high-risk and low-risk sports groups' sensation need satisfaction, emotion regulation, and agency difficulty over time. In addition, we reported Greenhouse Geisser correction and Bonferroni multiple comparison results in instances where the analysis assumptions were violated (Bathke et al., 2009).

**3 Results[[3]](#footnote-3)**

**Main analysis**

**Emotion Regulation**

The 3 (time) × 4 (group) mixed-model ANOVA results provided support for the emotion regulation hypothesizes. Specifically, the results revealed a significant main effect for Time, *F*(1.47, 231.63) = 13.30, *p* = .00, *ηp2* = .07, and a significant time × group interaction for emotion regulation *F*(4.42, 231.63) = 3.19, *p* = .01, *ηp2* = .05 (see Table 1). Probing of the interaction via one-way repeated measures ANOVAs revealed a significant increase in emotion regulation difficulty across time for mountaineers *F*(1.52, 47.16) = 11.46, *p* = .00, *ηp2* = .27 and traditional climbers *F*(1.48, 84.68) = 14.77, *p* = .00, *ηp2* = .20. Bonferroni comparisons revealed that both mountaineers’ and traditional climbers’ difficulty with emotion regulation significantly increased between one day and one week (mountaineers *p* = .02; tradition climbers *p* = .00), and between one day and six weeks (mountaineers *p* = .00; traditional climbers *p* = .00) post-activity. Traditional climbers’ difficulty also increased between one week and six weeks (*p* = .02). The follow-up tests for sport climbers (*p* = .95) and low-risk sport controls (*p* = .50) revealed no significant differences across time.

**Agency**

The 3 (time) × 4 (group) mixed-model ANOVA results did not support the agency hypothesizes. Specifically, the results revealed a significant main effect for Time, *F*(1.39, 216.62) = 13.97, *p* < .00, *ηp2* = .08, and no significant time × group interaction for agency, *F*(4.13, 216.62) = .86, *p* = .48, *ηp2* = .01 (see Table 1). Follow-up tests for the main effect for time revealed that participants significantly increased in agency difficulty between one day and one week (*p =* .00), one week and six weeks (*p* = .00), and one day and six weeks (*p* = .00).

|  |
| --- |
| Table 1*Study 1 differences between Traditional climbers, Mountaineers, Sport climbers, Low-risk sport controls for emotion regulation, agency, and sensation seeking difficulty after participation.* |
| Group  | Time 1  | Time 2 | Time 3  |
| Emotion Regulation difficulty | ω = .88, α = 0.88 | ω = .94, α = 0.94 | ω = .96, α = 0.95 |
| Traditional rock climbers  | 17.18 (6.80)  | 20.05 (9.24)  | 21.79 (9.59)a |
| Mountaineers  | 15.56 (8.31)  | 18.75 (9.84)  | 20.43 (9.00)a  |
| Sport climbers  | 16.62 (7.79)  | 16.47 (8.39)  | 16.33 (9.55) |
| Low-risk sport controls  | 16.80 (7.89) | 17.26 (8.05) | 17.90 (9.10) |
| Agency difficulty | ω = .87, α = 0.87 | ω = .94, α = 0.94 | ω = .95, α = 0.95 |
| Traditional rock climbers  | 15.75 (7.15)  | 17.75 (8.72) | 19.70 (10.42)  |
| Mountaineers  | 14.87 (7.35)  | 16.25 (9.20) | 18.28 (9.99)  |
| Sport climbers  | 12.28 (5.33) | 12.42 (6.98)  | 13.23 (9.65)  |
| Low-risk sport controls  | 13.82 (7.00) | 14.72 (8.14) | 16.04 (9.06) |
| Sensation need satisfaction | ω = .89, α = 0.88 | ω = .92, α = 0.92 | ω = 94, α = 0.94 |
| Traditional rock climbers  | 32.68 (7.53)  | 33.63 (7.69)  | 34.37 (7.49)  |
| Mountaineers  | 31.71 (6.62)  | 33.65 (6.42)  | 34.65 (7.58)  |
| Sport climbers  | 30.04 (7.56)  | 30.28 (8.46)  | 31.14 (11.46)  |
| Low-risk sport controls  | 30.48 (7.48) | 29.96 (8.02) | 30.46 (8.75) |
| Note: a = significantly increased in difficulty across time. Time 1 = one day after participation, Time 2 = one week after participation, Time 3 = six weeks after participation, Mean (SD). *n* = sample size, traditional rock climbers *n =* 58, mountaineers *n* = 32, sport climbers *n* = 21, low-risk sport controls *n* = 50. ω = McDonald’s omega; α = Cronbach’s alphas. |

**Sensation Seeking**

The 3 (time) × 4 (group) mixed-model ANOVA results provided support for the sensation seeking hypothesizes. Specifically, the results revealed a significant main effect for Time, *F*(1.54, 242.13) = 4.08, *p* = .02, *ηp2* = .02, and no significant main effect for Group, *F*(3, 157) = 2.58, *p* = .055, *ηp2* = .04 or time × group interaction for sensation seeking, *F*(4.62,242.13) = 1.02, *p* = .39, *ηp2* = .01 (see Table 1). The follow up tests for the main effects revealed no significant increase in sensation seeking difficulty across time.

**Discussion**

The aim of Study 1 was to test our hypothesis that high-risk climbers (i.e., traditional climbers and mountaineers) would display different emotion regulation and agency profiles in the time after sports participation to comparable low-risk climbers (i.e., sport climbers) and low-risk controls (i.e., hikers, swimmers, golfers, cyclists). Consistent with our hypothesis, mountaineers' and traditional climbers' emotion regulation profiles differed significantly from low-risk sport climbers and low-risk sport controls. Specifically, as hypothesized, difficulty in emotion regulation significantly increased across time only in mountaineers and traditional climbers. These findings demonstrate that mountaineers and traditional climbers experience better emotion regulation one day after participation compared to one week and/or six weeks afterwards, indicating the emotion regulation function that high-risk climbing may serve.

 The findings for agency revealed no such differentiation between the sports. That is, regardless of the nature of the sport (i.e., high- or low-risk), participants experienced greater agentic difficulty as time increased from their previous participation. However, previous research indicates that agency is not a primary motive for engaging in low-risk activities (Barlow et al., 2013; Woodman, MacGregor, & Hardy, 2020), so this effect clearly warrants further attention.

None of the groups displayed significant differences in sensation need satisfaction. Specifically, mountaineers' and traditional climbers' sensation seeking profiles were no different from low-risk sport climbers, hikers, and swimmers. Thus, these results support our hypothesis and further refute the longstanding narrative that high-risk sports participants form a homogenous sensation seeking group (Freixanet, 1991; Zuckerman, 2007). In summary, the results supported the hypothesis that higher risk climbers would experience greater emotion regulation difficulties between participation but did not support the hypothesis that agency would reveal a similar pattern.

**Study 2**

The aim of Study 2 was twofold. First, we aimed to retest the hypothesis from Study 1. Second, we aimed to focus more sharply on different rock-climbing disciplines to test the hypothesis that traditional climbers will demonstrate significantly different emotion regulation and agency profiles during the time after sports participation compared to low-risk forms of climbing (such as sport climbers and boulderers) and low-risk sport controls. Specifically, only traditional climbers will significantly increase in agentic emotion regulation difficulty post participation.

**Methods**

**Participants**

We recruited a different sample ofparticipants (*n* = 134) adopting the same method as Study 1. We checked participants ' email addresses to ensure the same participants did not participate in multiple studies. In this study, there was no missing data from this sample. The groups were 35 traditional climbers (28 men, 7 women; *M*age*=* 29.82, *SD =* 12.34; *M*years of participation = 9.87, *SD* = 10.87), 30 sport climbers (22 men, 7 women, 1 other; *M*age*=* 24.06, *SD =* 5.49; *M*years of participation = 7.56, *SD* = 4.86), and 32 boulderers (24 men, 8 women; *M*age*=* 27.64, *SD =* 10.59; *M*years of participation= 8.12, *SD* = 10.49). Bouldering is a form of rock climbing performed on small rock formations or arterial climbing walls without ropes or gear placement for protection. Boulders are typically 1-4 meters high with large foam mats (i.e., bouldering mats) placed around the falling zone for protection in the event of a fall. Due to the relatively low consequences of a fall (i.e., falling 1-4 meters onto foam mats), the risk of severe injury or death is minimal, and therefore we consider bouldering a low-risk sport. We also recruited 37 low-risk sport controls (18 men, 19 women; *M*age*=* 34.27, *SD =* 15.00; *M*years of participation = 10.36, *SD* = 12.77). Low-risk sport controlwere individuals who participated in various low-risk sporting activities (such as running, golf, squash, swimming, lacrosse, rowing) and did not participate in any high-risk sporting activities.

**Measures and procedures**

Participants in Study 2 completed the exact same procedures and measures as those in Study 1. McDonald’s omega and Cronbach’s alphas demonstrated very good reliability for all the SEAS 6-item factors across all three time points (see Table 2).

**Results**

**Main analysis**

**Emotion Regulation**

The 3 (time) × 4 (group) mixed-model ANOVA results provided support for the emotion regulation hypothesizes. Specifically, the results revealed a significant main effect for Time, *F*(1.55, 202.62) = 16.94, *p* = .00, *ηp2* = .11, Group, *F*(3, 130) = 2.95, *p* = .03, *ηp2* = .06 and a significant time × group interaction for emotion regulation, *F*(4.67, 202.62) = 5.62, *p* = .00, *ηp2* = .11; see Table 2). Probing of the interaction revealed a significant increase in emotion regulation difficulty across time for traditional climbers only, *F*(1.54, 52.36) = 14.98, *p* = .00, *ηp2* = .30. Bonferroni comparisons revealed traditional climbers’ difficulty with emotion regulation significantly increased between one day and one week (*p* = .00), one day and six weeks (*p* = .00). The between-groups differences were significant at Time 2, *F*(3, 130) = 3.35, *p* = .02, *ηp2* = .07, and at Time 3, *F*(3, 130) = 4.97, *p* = .00, *ηp2* = .10, and not at Time 1 (*p* = .65). Bonferroni multiple comparisons revealed that traditional climbers experienced significantly greater emotion regulation difficulty compared to low-risk sport participants one week (*p* = .01) and six weeks (*p* = .00) after sport participation.

**Agency**

The 3 (time) × 4 (group) mixed-model ANOVA results provided support for the agency hypothesizes. Specifically, the results revealed a significant main effect for Time, *F*(1.57, 205.29) = 9.68, *p* = .00, *ηp2* = .06 and a significant time × group interaction for agency, *F*(4.73, 205.29) = .7.81, *p* = .00, *ηp2* = .15 (see Table 2). Probing of the interaction via one-way repeated measures ANOVAs revealed a significant increase in agency difficulty across time for traditional climbers only, *F*(1.65, 56.33) = 13.31, *p* = .00 *ηp2* = .28. Bonferroni comparisons revealed that traditional climbers’ difficulty with agency significantly increased between one day and six weeks (*p* = .00), and between one week and six weeks (*p* = .00). Low-risk controls difficulty with agency significantly decrease post participation *F*(1.55, 55.57) = 7.11, *p* = .00 *ηp2* = .16. Bonferroni comparisons revealed that low-risk controls difficulty with agency significantly decreased between one day and one weeks (*p* = .01), and between one day and six weeks (*p* = .02). There was also a between-group difference in agency difficulty at six weeks after sport participation, *F*(3, 130) = 4.77, *p* = .00, *ηp2* = .09, with no such differences at one day (*p* = .75) or one week (*p* = .26). Bonferroni comparisons revealed that traditional climbers experienced significantly greater difficulty in agency than low-risk sports participants six weeks after sports participation (*p* = .00), which further supports the hypothesis.

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| Table 2*Study 2 differences between Traditional climbers, Sport climbers, Boulderers, and Low-risk sport controls for emotion regulation, agency, and sensation seeking difficulty after participation.* |
| Group  | Time 1  | Time 2  | Time 3  |
| Emotion Regulation difficulty | ω = .83, α = 0.83 | ω = .92, α = 0.91 | ω = .94, α = 0.94 |
| Traditional rock climbers  | 20.42 (8.47)  | 24.17 (8.31)b  | 26.91 (9.95)a  |
| Sport climbers  | 19.70 (6.53)  | 21.00 (7.52)b  | 22.83 (9.08) |
| Boulderers  | 20.84 (7.64) | 20.43 (8.47) | 22.46 (10.05) |
| Low risk sport controls  | 18.72 (7.17) | 18.02 (8.57) | 18.18 (9.22) |
| Agency difficulty | ω = .85, α = 0.84 | ω = .91, α = 0.91 | ω = .94, α = 0.94 |
| Traditional rock climbers  | 16.94 (7.86)  | 19.17 (9.17) | 23.40 (11.02)ab |
| Sport climbers  | 15.53 (5.92) | 16.36 (7.16)  | 18.13 (8.99)  |
| Boulderers  | 16.87 (7.32) | 16.68 (8.18) | 17.84 (9.70) |
| Low risk sport controls  | 17.43 (7.48) | 15.40 (8.12) | 15.10 (7.88) |
| Sensation need satisfaction | ω = .89, α = 0.88 | ω = .89 ,α = 0.89 | ω = .93, α = 0.93 |
| Traditional rock climbers  | 34.68 (6.46)  | 35.14 (6.76) | 36.02 (7.12)  |
| Sport climbers  | 35.00 (5.05) | 35.03 (6.25)  | 35.40 (5.81)  |
| Boulderers  | 34.71 (7.10) | 33.50 (7.71) | 34.43 (6.65) |
| Low-risk sport controls  | 32.72 (5.37) | 33.16 (4.93) | 33.32 (7.38) |
| Note: a = significantly increased in difficulty across time; b = significantly greater than the low-risk sports group. Time 1 = one day after participation, Time 2 = one week after participation, Time 3 = six weeks after participation, Mean (SD). *n* = sample size, traditional rock climbers *n =* 35, sport climbers *n* = 30, boulderers *n* = 32, low-risk sport controls *n* = 37. ω = McDonald’s omega; α = Cronbach’s alphas. |

**Sensation Seeking**

The 3 (time) × 4 (group) mixed-model ANOVA results supported the sensation seeking hypothesis, revealing no main effect for Time, *F*(1.69, 220.75) = 1.51, *p* = .22, *ηp2* = .01, and Group, *F*(3, 130) = .1.03, *p* = .38, *ηp2* = .02, and no significant time × group interaction for sensation seeking, *F*(5.09, 220.75) = .74,*p* = .59, *ηp2* = .01 (see Table 2).

**Discussion**

The purpose of Study 2 was to retest the hypothesis of Study 1 with a sharper focus on different rock-climbing disciplines. Specifically, we aimed to test the hypothesis that traditional climbers would demonstrate a profile of emotion regulation and agency difficulty different from that of their relatively low-risk counterparts (i.e., sport climbers, boulderers, and low-risk controls). The results supported this hypothesis; only traditional climbers experienced a significant increase in emotional regulation and agency difficulty across time. Furthermore, the sensation seeking results supported our hypothesis and results from Study 1, in which none of the groups differed from one another or increased in sensation need satisfaction across time. These findings further debunk the sensation seeking explanation for participating in all high-risk activities. The results thus support the notion that the greater agentic emotion regulation experiences traditional climbing provide serve a regulatory function to reduce participants' agentic emotion regulation difficulties (Barlow et al., 2013).

**Study 3**

 The aim of Study 3 was twofold. First, we aimed to retest the hypothesis from Studies 1 and 2 that traditional climbers will demonstrate significantly more pronounced emotion regulation and agency difficulty after sports participation compared to low-risk participants. Second, we aimed to address the main limitation of Studies 1 and 2; namely, the cross-sectional retrospective design. Specifically, we had not been in a position ethically to require participants to withdraw for long periods of time from their meaningful activity. Rather perversely, the recent COVID-19 pandemic provided a unique opportunity to test the hypotheses in a longitudinal design while people were temporarily prevented from participating in their activity.

**Methods**

**Participants**

We recruited a different sample of participants (*n* = 45) to that of Studies 1 and 2. The following groups satisfied the inclusion criteria: 16 traditional climbers (6 men, 10 women; *M*age*=* 31.75, *SD =* 10.40; *M*years of participation = 9.62, *SD* = 8.40); 17 low-risk climbers (i.e., sport climbers and boulderers; 6 men, 11women; *M*age*=* 28.72, *SD =* 9.52; *M*years of participation = 4.88, *SD* = 4.62); and 12 low- risk sport controls (6 men, 6 women; *M*age*=* 33.91, *SD =* 15.15; *M*years of participation = 25.33, *SD* = 18.24). In this study, there was no missing data from this sample. Low-risk sport control were individuals who participated in a variety of low-risk sports (i.e., rowing, football, swimming, hiking, athletics) and did not participate in any high-risk sport (i.e., traditional climbing, mountaineering, paragliding). We combined sport climbers and boulderers into a single group as there were insufficient numbers within each group to analyze separately. We deemed this appropriate given that both sports are low-risk climbing activities and both groups reported similar profiles when observed independently in Study 2. Unfortunately, due to participant dropout and sporting participation during the study, we struggled to recruit a satisfactory sample size for this study (priori G\*power 3×3 mixed model ANOVA analysis α = .05, β = .80, small effect size *ηp2* = .02, total sample size required 102; Faul et al., 2007). Thus, the following analysis was only sensitive to identifying medium effect sizes (*ηp2* = .06, total sample size required 36; Faul et al., 2007).

**Measures and Procedure**

We largely replicated the measures and procedures from Studies 1 and 2 (i.e., demographic survey and SEAS). However, rather than completing the SEASs retrospectively at a single time point, participants completed the SEAS three times over fourteen days. After agreeing to participate, participants stated when they last participated in their sport before completing the first SEAS. We then contacted participants via email seven and fourteen days later to complete the second and third SEAS, respectively. Participants completed the study at different time points throughout the pandemic, and therefore the time between participants' last sporting participation and the completion of the first SEAS varied. Prior to the study, these differences in participants' absence from their sport would have most likely affected their sense of agentic emotion regulation, especially for traditional climbers. Therefore, we included the number of days absent from participants' sport prior to participation in this study as a covariate to control for this. This design allowed us to investigate participants' emotion regulation and agency fluctuation over a two-week period of sporting absence. To screen for sporting participation during this time, participants reported whether they had participated in their sport over this two-week period. The uncertainty of the ongoing government guidelines and international laws regarding social and sporting activities throughout the pandemic led us to restrict the timeline to a two-week period, thus ensuring that participants remained in lockdown for this study. Furthermore, based on traditional climbers’ reports, we considered a 2-week period long enough to capture the fluctuation of these individuals’ sense of agentic emotion regulation (Barlow et al., 2013; Lester, 2004). Therefore, we used the following introductory statement to complete the SEAS; *Please answer the following statements thinking about your feelings toward your life after not participating in your preferred sport or activity for [insert number of days absence] days*. Upon completing all three SEASs, participants were eligible to enter a £50 prize draw.

McDonald’s omega and Cronbach’s alphas demonstrated good reliability for all the SEAS 6-item factors across all three time points (see Table 3).

**Results[[4]](#footnote-4)**

**Main analysis**

**Emotion Regulation**

The 3 (time) × 3 (group) mixed-model ANOVA results supported the emotion regulation hypothesis. Specifically, the results revealed a significant time × group interaction for emotion regulation, *F*(4, 84) = 2.78, *p* = .03, *ηp2* = .11 (see Table 3). Probing the interaction revealed a significant increase in emotion regulation difficulty across time for traditional climbers, *F*(2, 30) = 7.09, *p* = .00, *ηp2* = .32. Bonferroni comparisons revealed traditional climbers’ difficulty with emotion regulation significantly increased between Day 1 and Day 14 (*p* = .02). The repeated measures ANOVAs revealed no significant differences in emotion regulation difficulty across time for low-risk climbers (*p* = .54) and low-risk controls (*p* = .75). We also performed one-way ANOVAs to identify differences in emotion regulation difficulty between groups at each of the three time points. Results revealed a significant group difference at Day 7, *F*(2, 42) = 3.47, *p* = .04, *ηp2* = .14; and Day 14, *F*(2, 42) = 3.98, *p* = .02, *ηp2* = .16; no such differences emerged for Day 1 (*p* = .06). Multiple comparisons revealed that traditional climbers experienced significantly greater difficulty in emotion regulation compared to low-risk control participants on Day 7 (*p* = .05) and Day 14 (*p* = .02). No significant differences were observed between traditional climbers and low-risk climbers or low-risk climbers and controls.

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| Table 3*Study 3 differences between Traditional climbers, Sport climbers and Boulderers combined, and Low-risk sport controls for emotion regulation, agency, and sensation seeking difficulty after participation.* |
| Group | Time 1  | Time 2  | Time 3  |
| Emotion Regulation difficulty | ω = .91, α = 0.91 | ω = .92, α = 0.92 | ω = .90, α = 0.90 |
| Traditional rock climbers  | 23.31 (8.71)  | 25.43 (8.18)b  | 26.93 (8.82)ab  |
| Sport climbers and Boulderers  | 25.94 (7.18)  | 24.82 (5.79)  | 25.05 (6.17) |
| Low risk sport controls  | 18.33 (9.27) | 18.41 (8.87) | 19.00 (7.53) |
| Agency difficulty | ω = .75, α = 0.75 | ω = .82, α = 0.82 | ω = .90, α = 0.90 |
| Traditional rock climbers  | 25.00 (7.19)  | 24.75 (7.73) | 28.18 (8.32)ac  |
| Sport climbers and Boulderers  | 22.88 (4.15) | 21.94 (5.23)  | 20.88 (5.51)  |
| Low-risk sport controls  | 19.75 (8.03) | 20.33 (8.08) | 21.08 (9.23) |
| Sensation need satisfaction | ω = .75, α = 0.76 | ω = .89, α = 0.87 | ω = .86, α = 0.85 |
| Traditional rock climbers  | 36.25 (4.35)  | 36.93 (4.94) | 37.56 (4.65)  |
| Sport climbers and Boulderers  | 37.00 (4.09) | 37.64 (4.94)  | 37.05 (5.28)  |
| Low risk sport controls  | 34.66 (4.59) | 34.91 (3.91) | 35.58 (4.12) |
| Note: a = significantly increased in difficulty across time; b = significantly greater than the Low-risk sports group; c = significantly greater than other two groups. Time 1 = one day after participation, Time 2 = one week after participation, Time 3 = six weeks after participation, Mean (SD). *n* = sample size, traditional rock climbers *n =* 16, sport climbers and boulderers *n* = 17, low-risk sport controls *n* = 12. ω = McDonald’s omega; α = Cronbach’s alphas. |

**Agency**

The 3 (time) × 3 (group) mixed-model ANOVA results provided support for the agency hypothesis. Specifically, the results revealed a significant time × group interaction for agency, *F*(4, 84) = .3.85, *p* = .00, *ηp2* = .15 (see Table 3). Bonferroni tests revealed a significant increase in agency difficulty across time for traditional climbers only, *F*(2, 30) = 8.54, *p* .00, *ηp2* = .36; traditional climbers’ difficulty with agency significantly increased between Day 1 and Day 14 (*p* = .00), and between Day 7 and Day 14 (*p* = .00). There were no such differences in agency difficulty across time for low-risk climbers (*p* = .14) and low-risk controls (*p* = .64). These results support the hypothesis. Furthermore, one-way randomized ANOVAs revealed a significant group difference in agency difficulty at Day 14, *F*(2, 42) = 4.58, *p* = .01, *ηp2* = .17, with no differences at Day 1 (*p* = .11) or Day 7 (*p* = .24). Multiple comparisons revealed that traditional climbers experienced significantly greater difficulty in agency compared to low-risk climbers (*p* = .02) and low-risk controls (*p* = .05) 14 days after sports participation.

**Sensation Seeking**

The 3 (time) × 3 (group) mixed-model ANOVA results provided support for the sensation seeking hypothesis. Specifically, the results revealed no significant time × group interaction for sensation seeking, *F*(4, 82) = .49, *p* = .74, *ηp2* = .02 (see Table 3), and no main effect for Time, *F*(2, 82) = .06, *p* = .93, *ηp*2 = .002) or Group, *F*(2, 41) = .86, *p* = .42, *ηp*2 = .04 (see Table 3).

**Discussion**

The purpose of Study 3 was to replicate the findings of Studies 1 and 2 and address the limitation of the cross-sectional retrospective design by investigating the *in vivo* effects of sports absence. The present study supported our hypothesis and replicated the emotional regulation and sensation seeking findings from Studies 1 and 2 and the agency findings of Study 2. Specifically, only traditional climbers experienced a significant increase in emotional regulation and agency difficulty after participation, compared to the low-risk climbers and low-risk controls who experienced no change. Furthermore, none of the groups differed from one another or increased in sensation need satisfaction across time. These longitudinal results provide further evidence for the agentic emotion regulation function that high-risk climbing serves and individuals’ associated motive, specifically to benefit from an agentic emotion regulation transfer from their activity to everyday life.

**General discussion**

This research aimed to investigate the process of agentic emotion regulation and sensation need satisfaction in the time after sports participation. We conducted three studies aimed to demonstrate that high-risk climbers (i.e., traditional climbers) display different emotion regulation and agency profiles in the time after sports participation than comparable low-risk climbers (i.e., sport climbers and boulderers) and low-risk sport controls (i.e., footballers, swimmers).

**Agency and emotion regulation profiles**

Consistent with our hypothesis, our retrospective and longitudinal results revealed that high-risk climbers possess different *emotion regulation* and *agency* profiles in the time between sporting participation than low-risk climbers and sport controls. Specifically, only high-risk climbers experienced an increase in *agency* and *emotion regulation difficulty* in the time between their sporting participation, as hypothesized. These results further support Barlow et al.’s (2013) cross-sectional research, in which mountaineers’ emotion regulation and agency profiles before, during and immediately after participation significantly differed from that of skydivers and sport controls.

As we controlled for physical (i.e., the physical requirements of low-risk sporting activities) and environmental (i.e., the mountainous natural environment of sport climbing and bouldering) factors, one can attribute the emotion regulation and agency benefits high-risk climbers experience to the specific risk that is inherent in their sport. This increased risk provides high-risk climbers a greater opportunity to experience and subsequently regulate externally-derived emotions (i.e., fear) in ways that are not readily available in individuals’ normative everyday lives or low-risk sports (see Barlow et al., 2013; Woodman et al., 2010).

Unlike in low-risk sports, physical danger is innate in mountaineering and traditional climbing. This risk requires participants to control strong emotions derived from the demanding environment and act agentically to mitigate potentially life-threatening situations (Woodman et al., 2010). The emotions that are experienced in the high-risk climbing domain are predominantly driven by sources within participants’ control. For example, when controlling feelings of fear to avoid falling when climbing or finding a way past a crevasse, the climber acts as an agent, rather than reacting to uncontrollable forces (Lester, 2004). Thus, the experience of emotion regulation and agency is central to mountaineers’ and traditional climbers’ engagement with their activity.

In line with Castanier et al.’s (2011) proposal, the positive agentic emotion regulation benefits that high-risk climbers transferred back into their daily lives did not last long (i.e., less than six weeks). Across the mountaineering and traditional climbing literature, participants have reported a plethora of difficulties establishing control over the self and interpreting and regulating their emotions in their daily life domains (Lester, 2004). These intrapersonal difficulties subsequently magnified the difficulty and distress they experienced in their interpersonal lives (see Barlow et al., 2013; Woodman et al., 2010). Lester (1983, p. 34) suggested that for high-risk climbers many aspects of domestic life, especially maintaining romantic relationships “were more stressful to the average team member than were the icy conditions in a fragile tent on a snowy ridge in high winds with inadequate oxygen”. Thus, the rate at which these positive agentic emotion regulation benefits deplete could be accentuated by their return to their domestic environment where they have trouble establishing control over themselves and regulating their emotions. Collectively, these findings provide compelling evidence for the agentic emotion regulation function that high-risk climbing serves.

**Sensation seeking**

These results across all three studies support our hypothesis that mountaineers' and traditional climbers' sensation need satisfaction profiles are no different from low-risk climbers or low-risk sports participants. Specifically, as hypothesized, none of the groups significantly differed from one another or significantly increased in *sensation need satisfaction* between participation. The present data further refute Zuckerman’s (2007) sensation seeking narrative and previous literature (Cronin, 1991; Maher et al., 2015) suggesting that high-risk sportspeople are simply a homogenous group of sensation seekers. These findings confirm previous research (Barlow et al., 2013; Woodman et al., 2020) and participants’ reported experiences (Lester, 1983, 2004) that sensation seeking is not a primary motive for such high-risk climbing endeavors.

**Implications, limitations, and future research directions**

The current findings have important implications for risk-taking research. First, the present findings suggest a link between increased high-risk sports absence and agentic emotion regulation difficulty, indicating the positive regulatory function high-risk sports serve and individuals’ motives to participate in their high-risk sport as a means of gleaning such a benefit. Second, a wealth of research has identified causal relationships between agency and emotion regulation difficulties and antisocial risk-taking behaviors, especially among adolescents (Eisenberg et al., 2001). As inferred by the present data, high-risk sports can effectively regulate one’s agency and emotional difficulties (Barlow et al., 2013) and may benefit individuals who engage in unacceptable risk-taking by engaging in specific forms of high-risk sports (Eisenberg et al., 2001). For example, high-risk sports could allow these individuals to experience a high level of control over the self, regulate externally derived identifiable emotions, and glean an agency, emotion regulation, and self-esteem benefit (see Woodman et al., 2020). Similarly, future research would do well to investigate the antecedent and response-based emotion regulation strategies high-risk sports exercise and their effect on regulating strong emotions in domestic life (see process model of emotion regulation, Gross, 2008). Evidently, more research is needed to illuminate these theoretical relationships or indeed any such benefits.

The retrospective data collection method was a clear limitation of Studies 1 and 2. Study 3 allowed us to measure individuals’ post-participation profiles during the sporting restrictions imposed by governments to combat the COVID-19 pandemic. Thus, by adopting a longitudinal design, we overcame these limitations and confirmed the validity of the retrospective design reflected by the concurring results of the three studies. The main limitation of Study 3 is the small sample size which points to the need for replication and further exploration. Despite the longitudinal design, we did not manipulate groups that would allow us to measure factors that determine the magnitude of these benefits, such as the danger, intensity, and duration of individuals’ latest participation. Indeed, this would be a fruitful and interesting avenue for future research but may be very difficult to implement as the prospect of another prolonged sporting absence would be hard to contemplate for most participants (see Barlow et al., 2013).

**Conclusion**

 The present studies provide compelling evidence that mountaineers and traditional climbers experience different emotion regulation and agency trajectories than low-risk climbers and sport controls. In short, the agentic emotion regulation benefits decay more evidently for those who engage in high-risk activities. One may thus conclude that this agentic emotion regulation difficulty is a primary motive for the need to return to the high-risk domain to glean an agentic emotion regulation benefit again. The present studies provide further evidence for the value of agentic emotion regulation theory in explaining motives for activities that seem less easily captured by other motivational frameworks such as self-determination theory (Woodman et al., 2020). The findings further support the positive agentic emotion regulation effects of engaging in high-risk sports, which are considerably different to other risk-taking endeavors (i.e., substance abuse). In summary, high-risk sports can provide a positive and effective means of regulating one’s agency and emotion regulation difficulties.

**Chapter 3: *It is so much more than that*: An attachment perspective on athletes’ relationship with their activities[[5]](#footnote-5)**

**Abstract**

This study sought to extend Bowlby’s (1969) attachment theory framework by exploring the nature of athletes’ relationship with their activities. Taking sport as an example, we interviewed 11 elite athletes across various sports (i.e., mountaineering, triathlon, kayaking). The interpretive phenomenological analysis (IPA) of interview data suggested that: (a) athletes’ activities were crucial for the provision of their *safe haven* and *secure base* needs, (b) athletes maintained close *proximity* with their activity to reduce *separation anxiety* in concern for their ability to cope without their activity and (c) athletes often sought their activity attachments in response to the lack of support and anxiety that they experienced in their closest social relationships. Athletes’ reports suggest that activity engagement serves as an adaptative coping response to the insecurity individuals experience in close social relationships. The findings from this paper provide a preliminary insight into the attachment emotion regulation role activities serve.

**Introduction**

Researchers have begun applying the framework underpinning Bowlby’s (1973) attachment theory to explore humans’ relationships with nonhuman agents (Keefer, Landau, & Sullivan, 2014). Subsequently, important lines of inquiry have arisen, most notably: (a) the ability of nonhuman agents to satisfy human attachment needs; (b) the degree to which Bowlby’s (1973) interpersonal attachment theory maps on to human-nonhuman relationships, considering their manifestation, dimensionality, and representation (i.e., secure/insecure); and (c) the health implications of developing such relationships. In this paper, we aim to explore the relationship that athletes develop with their activity and shed light on the areas posed above.

**Attachment Theory**

Bowlby's (1980) attachment theory suggested that humans are motivated to seek others who can satisfy their basic attachment needs for a safe haven from distress and a secure base from which to explore an uncertain world. Bowlby (1980) proposed that these basic attachment needs drive two behavioural systems. The attachment behavioural system is activated when individuals seek proximity with others for comfort in times of distress. The exploratory behavioural system is activated when individuals explore the external world, knowing that others will respond when needed. Research suggests that these systems are inextricably linked, in which attachment behaviors dramatically influence exploratory behaviors (Bowlby, 1969; Feeney & Van Vleet, 2010).

Five decades of attachment research has shown that the availability, responsiveness, and support of others significantly affect individuals’ attachment and exploratory behaviors (Mikulincer & Shaver, 2016). *Secure attachments* promote healthy development and wellbeing by supporting one’s needs for security and personal growth (Shaver & Mikulincer, 2002). Such interactions minimize social uncertainties and form positive beliefs and expectations that others are supportive and that the world is somewhat safe and can be increasingly explored (Bowlby, 1969). This sense of security forms positive imprints on individuals’ mental representations of themselves and others, corresponding to what Bowlby (1973) called *internal working models* (IWM). These IWMs guide how we interact with others and represent our beliefs concerning whether others will respond to our needs and whether we are worthy of receiving such support (Bowlby, 1973). When we see others as unsupportive and unpredictable, this leads to negative IWMs about ourselves and others, such as I am not worthy of deriving care, and I cannot trust others to provide care (Bowlby, 1973). These negative perceptions of the self and others represent two forms of *insecure attachment*. *Avoidantly attached* individuals are pessimistic about others’ ability to provide care and avoid emotionally intimate relationships (Cassidy & Kobak, 1988). *Anxiously attached* individuals display controlling and clinging behaviors to reduce their uncertainty about whether others will support them (Collins & Read, 1990). These two forms of *insecure attachment* generally lead to poorer emotion regulation and wellbeing (Collins & Feeney, 2004).

Bowlby (1969, 1973, 1980) argued that these initial IWMs are of substantial importance in shaping individuals’ relationships in the future and their strategies to regulate their emotional responses over time. Generally, secure attachments correspond with greater resilience, healthy social-emotional regulation strategies, and wellbeing, while insecure attachments promote the opposite image (Darling Rasmussen et al., 2019; Wright & Edginton, 2016).

**Nonhuman attachment figures**

Acknowledging that humans develop many relationships beyond those with other humans, researchers have begun exploring the bonds that we share with other agents through the theoretical lens of attachment theory (Bowlby, 1969, Keefer et al., 2014). By studying human-nonhuman bonds, we can begin to understand the attachment function these relationships serve. As Haven and Zeifman (1994) described, attachment bonds differ from other close relationships in their ability to support fundamental attachment functions. They suggested that attachment bonds should provide a *secure base* from which to explore, a *safe haven* during times of distress, elicit *proximity maintenance* behaviors for safety and enjoyment, and derive *separation anxiety* in concern for one’s wellbeing. Despite this clear definition, scarce research has clarified which behaviors define genuine attachments before investigating their relevance regarding human-nonhuman relationships (see Carr & Rockett, 2017).

 Research has sought to expand upon traditional human attachment representations by suggesting that nonhuman agents can fulfil the safe haven and secure base roles traditionally associated with other people (Keefer et al., 2014). Specifically, individuals’ relationships with pets (Rockett & Carr, 2014; Sable, 2013;), objects (Keefer, Landau, Rothschild, & Sullivan, 2012), deities (Beck & McDonald, 2004), media persona (Derrick, Gabriel, & Hugenberg, 2009), fictional characters (Greenwood, Pietromonaco, & Long, 2008), buildings (Nedelisky & Steele, 2009), and places (Giuliani, 2003) have shown to support secure base and safe haven attachment needs.

Although these attachment figures do not take on humans’ physical or verbal form, research has shown that these somewhat passive agents can provide a sense of comfort from distress and security when exploring (see Keefer et al., 2014). The security nonhuman bonds can provide is in part developed because individuals experience these nonhuman agents as more controllable and reliable than others (Keefer & Rothschild, 2020). Thus, the passive nature that defines nonhuman agents from other people allows these agents (i.e., objects, pets) to unconditionally serve individuals’ attachment needs (Carr & Rockett, 2017).

**Compensatory relationships**

Despite our desires to develop secure relationships, approximately 35% of infant-parent attachment bonds and 43% of adult attachment bonds are classified as insecure, undermining these individuals’ sense of security and wellbeing (Bakermans-Kranenburg & Van IJzendoorn, 2009; Turner et al., 2019). In an effort to mitigate these adverse effects, individuals report using nonhuman agents such as pets, deities, and objects to support their attachment needs, specifically when they lack interpersonal security (Granqvist & Hagekull, 1999; Keefer et al., 2014). Recently, Keefer and Rothschild (2020) identified that object attachments buffer against the negative effects induced by insecure relationships by bolstering one’s sense of control and wellbeing. Consequently, the stability and control that human-nonhuman attachment bonds provide may have significant compensatory value for those who lack secure social relationships.

Although research has aimed to broaden the scope of attachment theory to nonhuman agents, no research has yet investigated its application in people’s relationships with their activities. Thus, there is no empirical evidence to support the attachment function activities serve, or indeed, the compensatory benefits they may derive in response to social insecurity.

To that end, the purpose of this study is to gain an understanding of the attachment function activities serve through the lens of attachment theory.

**Aims**

Taking sport as an exemplar of activity, the present research aims to investigate the attachment function individuals’ activities serve. The following key questions guided the investigation: considering athletes’ activity experiences and the meaning of those experiences, what does activity attachment look like? To what extent do athletes’ relationships with activities support fundamental attachment and exploratory functioning? Finally, how do athletes’ activity attachments interact with their interpersonal attachments?

**Method**

**Design**

By adopting an Interpretative Phenomenological Analysis (IPA) approach, we sought to give voice to participants’ subjective experiences and understanding of their activity attachments (Creswell & Poth, 2016). Given that we were interested in how participants make sense of their activity attachment experiences and the meaning they attribute to these experiences, we deemed this qualitative approach as the most suitable.

**Participants**

We recruited participants via several only media outlets (i.e., Facebook, relevant forums, and athletes' websites). Participants opened the welcome page via the Qualtrics online URL link (Qualtrics, 2012), explaining the nature of the study and the privacy regulations in place to manage and protect their data. Eleven athletes who participated in various sports (i.e., traditional climbing, rugby, running) completed the demographic survey and informed consent form. All participants had previously or were currently performing at an elite level in their activity. We recorded each interview, with a mean duration of 175 minutes (*SD* = 32.04). We briefly detail interviewees in Table 1.

|  |
| --- |
| **Table1.** Participant descriptives |
| Pseudonym | Gender  | Age  |  | Preferred Sport  | Interview duration |
| Lisa  | Female | 35 |  | White water kayaking | 2hr 7min |
| Neil | Male  | 53 |  | Sea kayaking and mountaineering | 3hr 32min |
| Olivia  | Female  | 20 |  | Sailing  | 2hr 28min |
| Harry  | Male | 49 |  | Mountaineering | 3hr 4min |
| Eli  | Male  | 30 |  | Downhill mountain biking | 4hr 7min |
| Hannah | Female  | 24 |  | Triathlon  | 2hr 50min |
| James  | Male | 23 |  | Mountain running | 2hr 58min |
| Georgia  | Female  | 28 |  | Rugby | 2hr 52min |
| Owen  | Male | 60 |  | Sea kayaking and mountaineering | 2hr 48min |
| Aron | Male  | 21 |  | Karate | 2hr 25min |
| Ben | Male | 29 |  | Mountaineering | 2hr 48min |

**Procedure**

The primary researcher conducted semi-structured face-to-face interviews. When considering the design of the interview guide, we gradually progressed towards more sensitive topics throughout the interviews (Smith, 2003). We developed open-ended questions with probes (see Appendix B) to help identify athletes’ specific experiences relating to each question. With this in mind, we aimed to provide a "gentle nudge from the interviewer rather than being too explicit" (Smith, 2003, p. 61). First, we completed a pilot study to assess the effectiveness of the interview guide and familiarize ourselves with the questions (Elo et al., 2014). This interview was video and audio-recorded for discussion between the research team, including an experienced qualitative researcher. Participants received a summary of the interview topic in advance to probe self-reflection and enrich their personal information, emphasizing individuals’ thoughts, feelings, and beliefs concerning their activity experiences (Cohen & Crabtree, 2006). We encouraged participants to use ‘I’ statements instead of ‘we’ statements to encourage the expression of personal information throughout the interviews. Furthermore, we used probing to encourage athletes to talk about their experiences and feelings towards their activity in isolation from their relationships with others. This approach encouraged participants to discuss the support they gleaned from their activity rather than others engaging in the activity. We began interviews with an explanation of the research aims and a description of why we invited each individual to participate. Firstly, we asked broad questions about how they first became involved in sport, what inspired them, and their recent sporting experiences. The preliminary questions aimed to initiate collaborative dialogue with interviewees and to instill a sense of comfort in speaking freely about their experiences. Secondly, we then asked interviewees to discuss: (a) their emotional experiences in their sport; (b) the nature and intensity of their relationship with their sport; (c) their attachment behaviors towards their sporting domain, domestic life domain, and close others; (d) their experiences of temporary separation from sport and its effect on their wellbeing; (e) their negative experiences within sport; (f) the relative importance and influence of their sport in comparison to others. The researcher summarized each subject area and asked respondents if they thought the summary was accurate or wanted to add anything. Interviews took place in person, at a convenient place for the participant. The University’s Research Ethics Committee granted ethical approval.

**Data analysis**

The IPA analysis closely followed the guidelines of Smith and Shinebourne (2012). Firstly, the primary researcher read the first transcription several times, immersing themself in the data, and then noted anything of significance or interest regarding participant experiences in the left-hand margin. Secondly, using the notes mapped on the left margin, the primary researcher identified and labeled themes that characterized each section of the text. Thirdly, the ten remaining transcripts were then successively analyzed, assessing emergent themes for ‘both convergences and divergences, commonality and nuance’ (Smith & Shinebourne, 2012, p. 79). Finally, the researcher developed another code evaluating the emerging themes with existing theoretical concepts. We clustered the commonalities among these codes into themes in a hierarchical fashion. The structure and content of these themes were then considered, identifying prevailing superordinate and subordinate themes (see Figure 1).

**Research quality and trustworthiness**

The researchers’ preconceptions and experiences unavoidably influence the interpretations and conclusions drawn from qualitative data. This is especially relevant in IPA, which requires researchers to interpret, conceptualize, and clarify participants’ subjective experiences (Creswell & Poth, 2016). Therefore, to determine whether the primary researcher’s interpretations accurately reflected participants’ experiences, member checking was used (Smith & McGannon, 2018). We sent participants a copy of the manuscript to verify whether the researcher’s interpretation accurately depicted their experiences. None of the participants reported any disagreement with the researcher’s verbal summaries of their experiences. Assuming the position of a critical friend, the second author reviewed and discussed with the primary researcher each of the emerging themes to ensure the conclusions of the analysis were supported by the data and not by the primary researcher’s predispositions (Smith & McGannon, 2018; Sparkes & Smith, 2013).

**Results**

Six superordinate themes and fifteen subordinate themes emerged from the analysis, reflecting how participants made sense and experienced their activity attachments.Consistent with IPA practices, we developed a thematic map depicting critical elements of athletes’ activity attachment experiences (see Figure 1). How participants experienced these themes and their effects on individuals’ wellbeing will be discussed throughout the Results section below. We aim to contrast the similarities and differences in interpersonal and activity attachment behaviors and in doing so highlight why participants may develop activity attachment relationships.

**Figure 1**

*Emergent superordinate and subordinate themes of participants’ activity attachments.*

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**Theme 1: Strong emotional bond**

The first superordinate theme identified from participants’ experiences was the emotional bond that they developed towards their activity, in part, due to the rewards that they experienced. Neil summarized this relationship stating, "It’s central to the rewards that I get in this life".

 Interviewees used interpersonal relational language to portray the nature and intimacy of their activity relationships and often drew parallels between their activity and human relationships. For example, Lisa stated, “I would say now it’s probably my most reliable long-term relationship, like in every sense”. Hannah described her difficulty with others as they did not understand her "emotional attachment" to triathlon. She stated: "I don’t feel that they know how much triathlon means to me, so they see it as just a sport whereas for me it’s a way of life… they don’t understand my emotional attachment with it, whereas if I was to say to my mum about my relationship with (partner) I think she would understand... that’s why I get frustrated because they don’t understand that relationship is just as strong as a normal relationship”. Eli shared a similar account stating the “act of mountain biking, it’s an emotional experience, whereas the act of being in a relationship with someone that’s the same emotional experience”. Participants often drew from their intimate social relationships to describe the nature of their relationship with their activity, using terms such as ‘attachment’ to refer to their relational nature.

**Theme 2: Secure base**

The second superordinate theme identified from participants’ reports was the experience of their activity relationships as a *secure base* from which to glean a sense of confidence when exploring facets of themselves. These experiences strongly influenced their development and sense of identity.

***Stable***

Participants perceived their activity and activity environment as "always there", providing a sense of security and comfort regarding their ability to participate consistently. Neil explained, “… my working life has changed and evolved over the years, my personal relationships have changed; they turn out to be not permanent and yet I was on the east face of Tryfan [a mountain] with a friend a short while ago… I had memories of being in that same place thirty years earlier… everything’s changed but in some respects, on another level, nothing has changed, it’s me and the mountains again. It’s too small a word to say I appreciate that… so yeah it’s a very stable part of my life". When asked the role that climbing plays in his life, Harry replied: “well I guess a word that springs to mind is probably stability in terms of, just kind of gearing everything around it really, you know life… it’s pretty much everything yeah, work, life, thoughts, pastime, all my friends… we live here because of climbing, I got together with (partner) because of climbing, and we stayed together because of climbing… so it’s quite a comfortable skin to have, it’s pretty central… its impacted on all of life”. Likewise, Hannah suggested that triathlon brought “structure to life”, which helped maintain her emotional and relational stability.

 Owen explained that "the only thing that’s not stable in those terms is what happens to the individual. If you have a bad injury or accident or illness… the environment is always going to be there, you can just step down the level of the activity”. Despite facing future uncertainty, participants expressed some level of control over their current physical ability. Georgia expressed how she was left feeling “disposable” and saw her relationship with elite rugby as “sort of unstable” after being dropped from several events. Despite this, she felt that "it’s not rugby, the sport itself; it’s more the environment around and the people around it". Importantly, this suggests that participants’ sense of stability within their activities may differ across competitive and non-competitive domains and team and individual activities.

 The immutable presence of participants’ activities seemed to buffer against the instability of an ever-changing world by instilling a “sense of security that they will always be there one way or another”. Thus, the stable nature of participants’ activity environments made them an ideal host for providing a secure base.

***Transferable***

Participants described how they engaged in multiple activities, which supported their current access and physical ability. Hannah clarified this, stating, "I’ve got the three sports, so if I had to stop running, I’ve got the swimming as a backup or the cycling, so I am lucky in that sense because I’ve got something to back on to". Owen discussed how his activity participation is more contingent upon the season and his immediate access to equipment, stating, "I’ve never been like, what are you, a mountaineer or paddler? I’m both really. When I do it will depend on the time of year, and it will depend on the season or what I’ve got". All participants discussed similar experiences in which their activity participation could change depending on their access and current physical ability. These approaches provided a safety net in which participants could pursue various activities to fulfill their attachment needs.

***Agentic***

Participants highlighted the passive nature of their activity relationships, which supported a greater sense of agency in contrast to their experience of social relationships. Unlike the stability of his activity relationship, Neil emphasized how the stability of his romantic relationship was contingent on another person: "I’d like to think that offers the same stability, but it’s dependent upon another individual, it’s not just me, and the sense of stability I get from my involvement in the outdoors is down to me”. For Neil, his interpersonal relationships were more complicated and did not lie “100% [within my] control” altering his “mindset” regarding their stability. Conversely, Neil’s agentic relationship with activity was seen as “inevitably more stable” as his activity experiences were primarily contingent on his actions. This sense of agency evoked a sense of “certainty”, which he highlighted as a “big part” of why he engages in sea kayaking and mountaineering.

 Participants struggled to feel the same sense of agency and security in their social relationships as they did in their activity relationships. Eli stated: “In mountain biking, I do something, and it’s only me that gets the feeling back… in a relationship when you do something that affects the other person… it comes back at you… you are not in control”. Similarly, Hannah stated that within triathlon, “I can control my emotions… it’s more consistent, and it’s what I want to do and feel, whereas at home and stuff, I feel I’m more unstable emotionally and not consistent in terms of how I want to feel because of others… someone keeps asking you questions, questions, questions”. Eli and Hannah experienced a greater sense of emotional agency in their activity domain in ways that they did not experience around others.

Overall, participants experienced a sense of agency in their activity domain concerning their ability to regulate their emotions and engagement. As Ben summarized, sporting activity is something "I can do on my own terms" and does not require "give and take".

**Theme 3: Exploration**

The third superordinate theme that emerged from participants’ accounts was how the security of their activity relationships supported exploration. Activities often provided participants with a privileged space to express themselves and explore their thoughts, influencing their development and self-identity. These findings support Bowlby’s (1973) notion that secure relationships facilitate development by providing a secure base from which to explore.

***Self-expression and personal reflection***

Unlike the social and domestic areas of life, participants reported how their activity relationships allowed them to reflect and express themselves freely without “judgment”. As a result, participants felt accepted and safe when exploring their thoughts and expressing themselves verbally and physically within their activity domain. Both Lisa and Eli emphasized their ability to express themselves "through movement", which could not be compensated for elsewhere. Most participants reflected Lisa’s experience when comparing their self-expression behavior in their daily life and activity domain. Lisa stated, "I really think about what I’m going to say and I think about various outcomes as I’m speaking, and I don’t do that on the river". Accordingly, participants perceived their activity as a passive, non-verbal, and unjudgmental medium for expressing themselves freely.

 Participants also reported that their activity environment provided the security and freedom to self-reflect. For example, Eli stated, “you have moments in life where you reflect on things and you figure things out…and most of those moments if not all of them I’d say happen up a mountain somewhere…you definitely become aware of yourself and figure yourself out more than anywhere else… you can totally be yourself and be at one with your thoughts”. Others also displayed an awareness of their self-reflective behaviors in their activity domain. Lisa stated, “if there’s a lot going on, sometimes I find myself sat in an eddy thinking about something…a kind of calm place to think about something that doesn’t have, almost doesn’t have judgement”. She continued to state that kayaking provided her “quick access to that feeling of kind of like, being free in myself”. Lisa emphasized that the non-judgmental nature of her relationship with kayaking provided the secure base needed to feel “free” when exploring her thoughts. This pervasive sense of security enhanced participants’ ability to notice, reflect on, and understand their current mental states, resulting in a heightened level of “self-understanding”.

 Although participants readily described how they felt secure in exploring aspects of themselves within their activity domain, fewer examples emerged outside the activity domain. Neil stated, “I have a greater sense of confidence, and that can transfer back into my everyday life… I’m very aware that I have a sense of agency and independence in adventure sports. I have a sense of confidence that I can achieve desired outcomes, and that is sometimes elusive to me in other areas of my life, so I do rely on the confidence in my abilities that participating in adventure sports gives me”. Neil’s account is consistent with Agentic Emotion Regulation theory and research, which shows that high risk sports participants can glean a temporary agentic transfer from their activity to their everyday life (Woodman et al., 2010). However, the underlying mechanisms that support this agency transfer benefit differ from the interpersonal secure base notion of exploration. Specifically, Bowlby (1973) suggested that individuals feel secure exploring their external environment, knowing that they can return to a secure base. In contrast to Neil’s experience, the confidence and comfort Hannah experienced in triathlon did not extend beyond this domain, referring to herself as "a different person” in triathlon. Her ability to explore and express her feelings in triathlon is characteristic of her secure attachment to this activity (Bowlby, 1973).

***Identity development***

 Studies indicate that secure attachments encourage exploration by supporting personal endeavors and that these experiences contribute to developing one’s identity (Aron et al., 1991; Zimmermann, 2004). Consistent with this notion, all interviewees expressed the importance of their activities in shaping their identity. For example, Eli discussed how mountain biking had "shaped me into this person that I am, yeah if it wasn’t for that bond, then none of this amazing stuff would have really happened you know. I wouldn’t have kind of carried on with it and raced around the world... it’s made me learn a lot about myself as well because when you’re pushing yourself to the limits of your sport and especially when you’re taking risks, you learn how to cope with those stresses, and that can help you a lot in life". Similarly, Owen stated, "it’s made me the person I am" and became so influential "because it gives you satisfaction, it simulates you, you feel alive… that’s the one thing that’s been constant and has given you the most enjoyment in life". Importantly, Owen highlighted the “constant” nature of these sporting experiences facilitated their assimilation into his sense of self.

 Both Lisa and James recalled how their activity endeavors throughout adolescence helped shape their identity. James’s experience resembled that of Lisa, who stated, “I started properly myself when I was around 14ish…so I guess that’s a really important phase in your development as a person in terms of determining who you are and determining your place in the world...I really felt like that’s where I belonged”. She later stated, “I think it 100% defines who I am, and I wouldn’t know how to explain to someone who I am without kayaking”. For both Lisa and James, their activity provided a sense of early belonging and identity that helped ground them throughout this challenging period. Overall, participants’ activity experiences fostered a sense of belonging and joy while providing challenges that enhanced their personal growth and sense of self-actualization.

**Theme 4: Safe haven**

The fourth superordinate theme that emerged from participants’ accounts concerned using their activity as a *safe haven* to regulate and relieve distressing emotions.

***Emotion regulation***

 Participants discussed how their activity helped alleviate distressing emotions caused by challenges outside their activity domain via a process of emotion regulation. Neil provided clarity to this process, discussing how his activities helped to alter his “mindset, positivity, the way we identify the nature of a situation, the simple use of the word *problems*…It went beyond simple escape and forgetting about a situation, and it helped me to either find a solution or just change my mindset and realize it wasn’t a problem”. He recalled how engaging in mountaineering and sea kayaking helped him cope with anxiety and depression, stating, “The outdoors is a place where I could not only feel better, but I could address some of the causes, especially anxiety… I think I was learning anxiety control tools through my involvement in adventure sports that helped me in other areas of life where I needed to get out the door, pick up the phone, interact with someone”. Neil’s activity relationship not only provided a safe haven from distress but taught him "anxiety control tools" that transferred back into his interpersonal and intrapersonal life. Importantly, Neil’s experience speaks to an activity attachment-based emotion regulation transfer effect that helped manage his anxiety in domestic life. Lisa summarized the emotion regulation function that kayaking served her stating, “kayaking is really important for my mental health…I have something to help me process and help me get my thoughts in order”. Consequently, she stated, “I actively choose to go kayaking for the more kind of acute stressors”. Specifically, Lisa actively chose freestyle kayaking so that she did not need others to participate and could interact with the wave “in an angry way, or I can soul surf and like chill myself out, or I can just sit in the eddy and think, but I have the choice of how I do that”.

 All participants expressed the importance of their activity when reflecting on their ability to cope with emotional upset and bolster their wellbeing. Furthermore, some participants discussed how their ability to reflect on and regulate difficult emotions in their activity domain improved their ability to manage challenging emotions in their interpersonal and intrapersonal lives. Overall, participants’ accounts support Haven and Zeifman’s (1994) conceptualization of true safe-haven functioning in that their activity relationship improved their ability to regulate distressing emotions and provided a sense of comfort.

**Theme 5: Compensatory attachment**

 The following accounts illustrate how participants used their activity relationship as a safe haven and secure base to compensate for the inconsistent support that they experienced in their social relationships. Eli stated: "I know it works, and I know the outcome of mountain biking most of the time will help. Whereas seeking support from others, it doesn’t always work because you might get judged by them or they might cause more of a problem by putting in their input … mountain biking is so easy, and I enjoy it, so maybe I do that more than talk about my problems". These behaviors emerged in Eli’s life from a young age stating, "mum and dad split up when I was like 6 or 7", and he started using mountain biking “as a tool to deal with day-to-day problems, the stresses and the unpredictability of the day-to-day stuff”. For Eli, Mountain biking offered a refuge from the instability of family life. Consequently, Eli’s desire to seek proximity with mountain biking when experiencing distress had almost become instinctual. He stated: "when other things happen in life that stresses me out, then the urge to go for a ride is straight away way more. Pretty sure I’ve had an argument before and stormed out on my bike and gone for a ride, you know that direct, you can’t get any more direct than that, can you?”. Eli’s accounts support Bowlby’s (1973) notion that individuals activate their attachment system in times of distress and seek compensatory agents for support when others are viewed as unreliable.

 Lisa discussed using both kayaking and her social relationships as a safe haven, but preferred to approach kayaking first, stating, "I feel like I need that time to myself to sort of have that reflection time and that sort of sifting out what is actually the important issues here before I then talk to other people… I’ll generally feel more calm and just more able to deal with stresses after I’ve been kayaking". She later discussed how she felt more comfortable relying on kayaking because "barring major injury or major critical illness kayaking is always there you know. I can go, I can always go kayaking, whereas people aren’t always there, or people are, but there’s shit on, and you might not be number one priority. Yeah, I guess I feel more comfortable depending on kayaking because I know I can depend on kayaking, whereas even my closest relationships, everyone is human and so they might not for whatever reason be there when I need them". Evidently, Lisa felt her relationship with kayaking compensated for lack of consistent support in her social relationships. James expressed that both mountain running and family were the "two pillars that I kind of rely on". In James’s case, his decision to seek mountain running or social relationships for support was contingent on their ability to help him through the different problems he faced.

 All participants discussed how their activity relationships were inherently stable and could compensate for the lack of social security. Ultimately, participants approached different attachment agents (i.e., their sport or interpersonal relationships) depending on the situation and level of support they needed. Participants’ differing experiences, beliefs, and expectations concerning the reliability and supportiveness of their activity and interpersonal relationships suggest that different internal working model representations characterize these relationships. Specifically, participants’ accounts contrast the *security* of their relationship with activity with the *insecurity* they felt towards others. These findings are consistent with the compensatory hypothesis, suggesting that individuals are motivated to develop alternative attachments to compensate for deficiencies in another (Keefer et al., 2012; Zilcha-Mano, Mikulincer, & Shaver, 2011).

***Primary attachment relationship***

 Some participants discussed how they almost entirely sought their activity to fulfil their secure base and safe haven attachment needs. These participants displayed a lack of interest and discomfort confiding in others for emotional support. Thus, their activity became their *primary attachment relationship* over interpersonal others. Hannah stated, "when I’ve been angry or upset, I’ve never not done exercise, that is my way of relief". Hannah continued to express the importance of triathlon for regulating her mood, stating, "I can channel all my emotions into that sport. So even if I’m feeling ill and I go for a swim, my emotion has completely changed, so from that point of view it has a huge effect on that process". In relation to this process, she stated that she "wouldn’t get it anywhere else, so I don’t think I could rely on anything else to channel my emotion through". This preference emerged from the stability that triathlon provided, "the stability is a lot higher in triathlon because I know it’s always going to be there, whereas life and stuff I think the stability of like a family or if someone passed away that stability is gone and if you depend on someone, that stability is gone... I can’t use that stability for like emotional stuff... whereas with triathlon because I know it’s like a strong structure, I can put all my emotions into that”. When asked if she experienced this with her partner, she replied, “he’s only been in my life for a couple of years; I don’t want to rely on someone who could potentially hurt you, so I know that triathlon would never hurt me”. Underlying these beliefs and behaviours is a sense of *secure attachment* in which Hannah felt that her activity relationship would support her in times of need and help her process challenging emotions.

 The verbal nature of Hannah’s interaction with others also contributed to her felt discomfort when using other people for support. She stated, "I don’t like talking about my feelings to friends and family, I think because... I get more upset, if I felt stressed I would not express it to anyone". Conversely, triathlon provided a space to “talk over in my head to myself rather than express my feelings to someone else, and I feel more free doing that". When Hannah expressed her emotions to others, she found it difficult to control them and perceived others as intrusive in their influence upon her emotional states. As a result, triathlon became her primary attachment agent for seeking relief, stating, “I can’t think of anything else I would do if I were to get stressed, it would be just swim, bike or run”. Georgia expressed similar experiences, preferring to pursue rugby for comfort in lieu of developing romantic relationships. Georgia stated, "I couldn’t have a committed relationship because I jokingly say that I’m married to rugby all the time, yeah so that’s fine. I put that first, so I wouldn’t put a person first… I’m in a committed relationship to rugby". She continued to state, "because you’ve got rugby, you don’t go looking…rugby just fills that gap, like you don’t need a relationship". To that end, Georgia did not feel compelled to pursue such relationships, as rugby serves as her *primary attachment relationship* in fulfilling “that gap”.

 However, Georgia’s relationship with rugby was not always positive, stating, "I think there’s no escape from the stress inside rugby...when you’re stressed inside your escape there’s no escape then…that has more of an impact on me than the stress outside because I use the rugby as an escape and to deal with the stress of everyday life". In these instances, Georgie felt vulnerable to the stresses associated with the rugby domain as she exclusively relied on rugby as a safe haven.

 Participants’ accounts support Bowlby’s (1969, 1973) notion that in the absence of supportive relationships, individuals become more reliant on the secure relationships they have to meet their attachment needs. In this instance, participants sought comfort from their activity which served as a primary attachment agent over other people due to their *working model* representations as predictable, reliable, and consistent agents.

***Over-reliance and injury***

 Two subordinate themes emerged when discussing participants’ preferences to seek relief from their activity in isolation from other people. These themes consisted of participants’ over-reliance and subsequent injury by over-engaging in their activity to relieve distress and acknowledging that activity cannot fully compensate for verbal social support.

 High-stress levels left some participants feeling vulnerable to over-exertion and injury when seeking comfort from their activity domain in isolation from social support. Hannah discussed how the recent loss of a family member led to overexertion and injury as a means of coping. She stated, “my Grandad passing away, that has been a really stressful few months… I think that’s what’s caused the injury because I just kept running… but that’s how I sort of, I got the stress out". When asked if there was an alternative means of coping with her loss, she replied, "I don’t think there was any other way of getting that stress out apart from running. That was the only way for me I could relieve that stress. I couldn’t come home and talk about it to anyone cos it just gets you more stressed, and you think about it even more". This experience led to a 6-week absence from running because of a "stress fracture". Lisa struggled to control her urges to go kayaking when coping with daily stressors, stating, "my instant response is control, but then I don’t know, the fact that I’ll go kayaking on an injury or not do my admin maybe I’m not. I think the majority of the time I can control it. When I feel I need to use it as a coping mechanism, that’s when I’m more likely to go, *fuck it I’m going kayaking*". Others shared similar experiences in which they had become “really ill” from using their activity as “too much like therapy and not using it as a healthy thing”.

 In some instances, participants who relied almost exclusively on activity for their attachment needs experienced adverse physical and psychological effects. Their perceived lack of appropriate attachment alternatives made these participants more susceptible to injury and/or illness through their intense activity attachment behaviours.

***Mute relationship***

Despite not always feeling as comfortable, participants felt that their socialrelationships could compensate for the lack of verbal support encountered in their activity relationship. Participants discussed seeking verbal support from others when their sporting attachment behaviours ceased to be effective. Although Eli felt that mountain biking was “more reliable”, he also felt that "talking through stuff in a relationship can be more effective as a tool than mountain biking, but it’s not always there". He later recalls the difficulties he faced when using mountain biking as his sole attachment relationship stating, "you become so used to it becoming a tool for therapy and mental health that sometimes it doesn’t address the underlying issue, and I was still trying to ride but riding wasn’t fulfilling my needs of my mental health... I became too reliant on mountain biking and let things go too far, then I kind of had a breakdown. Whereas having therapy or counselling, I learned tools to use and using mountain biking as well, it became more of a healthy obsession… it’s a great tool, but then I guess I’ve abused it a bit too much". These experiences led Eli to balance his activity and interpersonal attachment behaviours, resulting in him feeling “more in control of my life and my emotions”.

 Participants expressed that talking to others could "address the problem in a different way that... sports couldn’t", acknowledging "the limitations of what it could do". However, not all participants felt comfortable seeking verbal interpersonal support. Hannah stated, “I don’t get upset when I express it to myself and in my sport. If I’m expressing it outside, I feel like I’m expressing a bigger can of worms and then it gets more deep… someone can keep asking you questions”. This discomfort confiding in others is representative of *avoidant attachment* behaviours and may in part explain her preference to seek her activity domain for self-reflection (Mikulincer & Shaver, 2016).

 Collectively, participants expressed the importance of their social relationships in compensating for the non-verbal nature of their activity relationship. Further to this, participants’ accounts suggest that seeking activity as a safe haven in lieu of social support did not always change the nature of their interpersonal and intrapersonal problems. Participants’ accounts support previous research (Doherty & Feeney, 2004), emphasizing the benefits of using multiple attachment relationships to support individuals’ needs for security and comfort. Specifically, participants could direct their attachment behaviours towards their activity or close social relationships depending on their availability and ability to provide support.

**Theme 6 Separation anxiety**

The sixth superordinate theme that emerged from participants’ accounts was the adverse effects of temporary separation from their activity. Activity separation impaired participants’ ability to regulate their emotions and wellbeing, resulting in *separation anxiety*. This separation anxiety gave rise to *proximity maintenance* and protective behaviours that ensured the provision of participants’ attachment needs through their activity.

***Separation distress and fear of injury and loss***

 While temporarily separated from their activity, all participants reported a sense of emotional upset, with growing concerns over their ability to manage challenging emotions. Participants’ experiences closely resembled that of Lisa who stated, “I think I would be really irritable and have a low threshold for just dealing with low-level annoyances of life”. Faced with temporary separation, all participants reported pursuing alternative physical activities, stating they would “have to do some sort of other sport” to “cope with the stresses of daily life”.

 While participants perceived their activity relationship as stable, the thought of losing this relationship emphasized its importance for regulating their wellbeing. Thus, participants displayed great displeasure and discomfort at the idea of their activity relationship ending. Lisa stated, "I have a fear of injury, I have a fear of not being able to go kayaking because I would need something else in its place as my coping mechanism… my main fear is for my mental health… I’d have a much lower threshold to deal with the challenges of life". Importantly, the fear of losing kayaking triggered the attachment system, giving rise to a sense of abandonment and concern for her own wellbeing. Georgia’s experiences align with this, stating, “when it comes to off-season, you end up lost… I remember I was just completely thrown… I feel like maybe I do worry about it a little bit, like not being there, like what would I do then? How would I do it? But at the moment that’s what I do, it’s how I destress”. Georgia’s sense of abandonment emphasized her feelings of vulnerability and worry that came from questioning her ability to cope without rugby. Harry expressed similar displeasure, stating, "it would be tricky to imagine not being able to do it, yeah that would be big. I wouldn’t like to entertain that too much… totally reliant on it for sure”.

 Participants’ ability to deal with stress and regulate their sense of wellbeing is, to a great extent, contingent on their ability to engage in their activity. As a result, periods of separation raised participants' concerns regarding their ability to cope with life's challenges. Participants' reports of separation distress are characteristic of an attachment bond. That is, the thought of losing an attachment relationship resulted in increased concern for one's ability to cope (see Kwong & Bartholomew 2011). Although the idea of not participating in their activity was distressing, participants anxious beliefs of this becoming an eventuality were minimal, which affirmed their representations as a stable relationship.

***Proximity maintenance***

 The principal function of separation anxiety is to promote *proximity-seeking* behaviours towards an attachment agent and ensure attachment support when needed (Bowlby, 1969).Due to the discomfort caused by activity separation, participants discussed the anxiolytic effects of maintaining close proximity and access to their activity.James stated, “If I’m in a setting where I can get access to mountains and access to hill running then yeah, I feel much more comfortable and much more myself”. For Lisa, being close to her activity left her feeling “noticeably more at ease” and “happier and more relaxed, less anxious”. Georgia discussed the comfort she experienced when training compared to the “every day”. In some cases, this comfort prevented her from fulfilling other obligations. She stated, “there were a lot of family holidays and I left my grandad’s funeral to go back to camp… which is sort of an escape from that as well because I felt secure in rugby… I’ve chosen rugby over doing things that other people think could be more important, but I feel better for being in rugby than I do for being anywhere else”. For Georgia rugby provided a sense of comfort and security that she did not experience elsewhere, resulting in proximity-seeking behaviours to “escape” the everyday.

 Participants’ separation anxiety and proximity maintenance behaviours towards their activities were functional because of concerns over their ability to maintain their wellbeing. These concerns gave rise to conscious actions and decisions aimed at maintaining proximity with their activity and influenced their lives and the lives of others around them.

***Protecting relationships***

Due to the importance of participants’ activity relationship, they discussed engaging in protective behaviours to enhance the quality and longevity of their activity participation. When contemplating on the thought of no longer mountaineering or sea kayaking, Neil stated, "it’s very uncomfortable to the extent that… I try and look after myself and try to make sure that I’m less prone to injury and I retain a certain level of physical fitness to let me do these things". Neil acknowledged that the physical pressures of aging caused him to engage in conscious protective behaviours that would likely ensure his continued participation in his activities. Harry discussed how a recent injury left him with no desire to climb as this would jeopardize his recovery and ability to return to climbing. He stated, "right now, with this rehab and surgery, I guess there’s a total goal of doing everything to make sure it all works out to primarily be able to go climb again. It’s quite interesting, it’s the first time in my life I’ve got no desire to climb because I’m just so protective over it at the moment… it’s quite a bizarre sensation".

 Facing an underlying spinal and neck injury, Georgia stated, "I’ve done my coaching qualification last summer, so I’ve been looking at other ways of keeping the sport around, but yeah, I think I’m worried that one day somebody is going to say so you can’t play anymore". Due to her uncertain future in rugby, coaching offered an alternative for maintaining her attachment to the activity. Others who engaged in multiple activities discussed alternating between them so as not to “overstress your body”. In the face of aging and injury, participants discussed many approaches to ensure their continued activity participation. Participants did not discuss their activity relationships as a ‘means to an end’, but rather as a relief and pleasure with the hope of sustaining a lifelong bond. These accounts support attachment literature suggesting that individuals are motivated to maintain relationships that fulfil their attachment needs (Bowlby, 1969).

**Discussion**

 We aimed to explore the nature of athletes’ relationship with their activities and expand Bowlby’s (1969) attachment theory into the field of activity relationships. The findings from this paper provide valuable initial insight into the secure base, and safe haven function that athletes’ activities serve. Specifically, we found that athletes’ beliefs and behaviors towards their activities supported the characteristics that define genuine secure attachment relationships. Specifically, athletes’ activities acted as a *safe haven* and *secure base* and derived *separation distress* and *proximity maintenance* behaviors (Haven & Zeifman, 1994). These findings thus support the contention that athletes form genuine attachment relationships with their activities. The key features of athletes’ activity attachments were their experiences of their activity relationships as controllable, dependable, and an important source of comfort during times of distress. Further to this, some athletes felt more comfortable seeking their activity for attachment support over their close social relationships. Athletes’ *secure* attachment behaviors towards their activity and *insecure* attachment beliefs towards others may indicate the compensatory function activity attachments serve in buffering against social insecurity and need thwarting.

**Activities provide strong emotional bonds**

 Although strong emotional bonds with other agents do not constitute attachment bonds in their own right (Haven & Zeifman, 1994), research suggests that relationships that meet people’s attachment needs contribute to strong emotional bonds (Bowlby, 1980; Wright & Edginton, 2016). Participants drew comparisons with their interpersonal relationships and used relational language to explain the nature and intimacy of their activity bonds. Participants used terms such as *reliable, stable, love, passion,* and *emotional attachment* to describe their activity “relationship that is just as strong as a normal relationship”. These findings support Epley and colleagues (2007) notion that individuals may anthropomorphize their nonhuman relationships to cope with insecure relationships and attain a sense of agency. Participants’ activity relationships supported a level of agency that they desired but did not experience in their interpersonal relationships (cf. Barlow et al., 2013; Woodman et al., 2010). As a result, participants may anthropomorphize their activity relationship to regulate their sense of agency and experience a level of support they seek from others (Gjersoe, Hall, & Hood, 2015; Keefer et al., 2016).

**Secure base**

 The present study provides preliminary evidence that athletes’ activities can act as a dependable comfort source and facilitate exploration and development (Haven & Zeifman, 1994). Participants perceived their activity relationship as stable, controllable, and transferable, resulting in a sense of security for serving their attachment needs. The passive and controllable nature of participants’ activity relationship helped bolster their sense of agency and emotional control, viewing their activity attachments as “inevitably more stable” than relationships with other people. Participants described their activity as a means of coping with distress and an opportunity to engage in reflective and expressive behaviours that ultimately deepened their understanding of themselves. However, some participants were unable to glean support from their close social relationships in this way. These participants often experienced insecure emotional patterns and unsupportive behaviors around others, undermining their sense of agency and emotional stability. These insecure social interactions encouraged some participants to use their activity as a *primary attachment relationship* to glean attachment support.

 In contrast to the stable view of activity attachments, Georgia provided an interesting account of her involvement in elite rugby as “sort of unstable” because of “the people around it”, which left her feeling “disposable”. Georgia's account questions other people's influence on the stability of an individual's activity attachments. As the level of control experienced across different activity contexts may vary, athletes may develop different beliefs regarding the stability of their activity relationships. For example, competitive activities have a clear endpoint, whereas a relationship with an adventure activity does not. Furthermore, participants who engage in solo activities are not reliant on others to engage in their activity. Thus, the competitive nature of the activity and the stability of individuals' interpersonal activity relationships may help explain the relative security of their activity attachments. We encourage future research to investigate the relevance of interpersonal attachments within the activity domain and their interactive effects on activity attachment behavior.

**Exploration**

Based on their behaviours, participants supported the idea that individuals are more likely to explore their internal and external worlds when they have a secure base to return to (Bowlby, 1973). Although activity cannot provide physical or verbal comfort, participants often viewed this form of support from others as intrusive, hindering their ability to explore their thoughts and express themselves freely. Our findings suggest that activity offered secure base support by providing participants with an emotional safehouse for reflecting and expressing their thoughts and behaviours. This support promoted a sense of confidence in their ability to express themselves, explore problems, and achieve a higher level of “self-understanding”. In this way, activity attachments supported a host of positive affective and developmental outcomes (i.e., enhanced self-awareness, psychological recovery, self-actualization, acceptance, and mindfulness; Ardelt & Grunwald, 2018; Sedikides & Skowronski, 1995). All athletes reported these activity experiences as fundamental in shaping their development and identity. These accounts are consistent with literature showing that one’s self-concept can expand by entering a relationship that supports self-reflection and exploration (Drigotas, Rusbult, Wieselquist, & Whitton, 1999; Murray & Holmes, 1997). Overall, participants sought out their activities as an ideal vessel for providing a sense of security from which to explore their interpersonal and intrapersonal challenges(Haven & Zeifman, 1994).

**Safe haven**

 In times of distress, participants tended to use their activity as an emotional safe house. This safe haven support was inextricably linked to the emotion regulation strategies that participants’ activity domain supported. Specifically, activity played an important role in reducing participants’ anxiety by allowing them to evaluate their feelings and exercise appraisal and reappraisal coping strategies. This safe haven support resulted in flexible behavioural regulation when coping with stress (Mikulincer & Shaver, 2016). Research has identified stable individual differences in emotion regulation strategies that arise from an extended dependence on agents who provide satisfactory or unsatisfactory support (Shaver & Mikulincer, 2002). In this instance, participants’ activity behaviours are in accordance with secure-based emotion regulation strategies observed in secure attachment bonds (Mikulincer, Shaver & Pereg, 2003). Over time, participants’ activity-based safe haven benefits instilled the view that activities provide a secure environment to regulate their emotions, solve problems, and ease distress (i.e., secure IWM). Consequently, participants discussed their desire to engage in their activity when coping with domestic stresses, anxiety, depression, and relationship issues.

 The findings of this paper also provide valuable insight into three affective regulation processes that were facilitated by participants’ activity attachments. Firstly, participants used their activity domain as a safe haven to regulate their interpersonal and intrapersonal anxieties (i.e., sporting domain emotion regulation benefit). Secondly, participants *transferred* their activity attachment emotion regulation strategies, such as emotional reflection and reappraisal, into their interpersonal and intrapersonal lives (i.e., activity attachment emotion regulation transfer benefit). Finally, some participants improved their ability to agentically regulate their emotions in everyday life by managing the challenging emotions their high-risk activities derived (i.e., mountaineering agentic emotion regulation *transfer* benefit, Barlow et al., 2013).

 Future research would do well to investigate the effectiveness of these activity attachment-based and transferable emotion regulation benefits on attenuating the negative effects inflicted by social insecurity. Specifically, we urge researchers to investigate the moderating effects of these activity emotion regulation processes on the relationship between insecure interpersonal attachment and wellbeing. This research would provide an insight into the underlying mechanisms that support the compensatory effects human-activity attachments serve (Keefer et al., 2014). Our findings support the suggestion that high-risk activities derive intense agentic emotion regulation experiences that improve individuals' ability to regulate their emotions in everyday life (i.e., Agentic Emotion Regulation Theory, Barlow et al., 2013; Willegers & Woodman, 2022). Beyond this, the present data suggest that these emotion regulation benefits extend beyond high-risk activities via a process of activity attachment behaviour. However, a lack of appropriate scales in the existing literature has hampered researchers' ability to investigate the therapeutic effects of activity-attachment-based emotion regulation processes on wellbeing. Thus, we encourage future research to develop the psychometric tools needed to investigate the compensatory function that human-activity attachment might serve.

**Compensatory attachment**

 While most participants reported using both activity and social relationships to satisfy their attachment needs, different representations emerged regarding their security. For example, participants reported secure regulation strategies in their activities, such as freely experiencing, reflecting, reappraising, and expressing emotions (Mikulincer & Shaver, 2016). In contrast, participants often reported insecure deactivating strategies in their social relationships, such as concealing and suppressing emotions to avoid closeness and emotional intimacy (Mikulincer & Florian, 1995). These emotion regulation behaviors in participants' activity and interpersonal domains started to develop as young as "6 or 7". Participants' accounts support (Bowlby, 1969, p.13) suggestion that children will become attached to an object "or a place or thing" in response to social insecurity.

 This research provides preliminary evidence that individuals can develop different beliefs, expectations, and behaviors towards their human and activity attachment bonds. More than this, our results show that if seeking physical or verbal support from others is perceived as ineffective or threatening, individuals may turn to non-living agents for attachment support. These findings are consistent with the compensatory attachment hypothesis (Keefer et al., 2014).

**The importance of interpersonal support**

While activity attachment clearly has affective regulation benefits, it would be inaccurate to suggest that activity might completely satisfy a participant’s attachment needs in substitution for a loving and supportive social relationship. Participants’ accounts did indicate that their activity attachments could temporarily compensate for the lack of stability and support experienced in their social relationships. However, when exposed to high levels of stress, participants who heavily depended on their activity to satisfy their attachment needs were more likely to sustain physical injuries. Thus, by over-activating their activity attachment behaviours, participants acknowledged that their activity could not compensate for the verbal support that they needed to overcome more stressful issues in their lives. Our findings expose a darker side to activity attachments, specifically, the physical risks of solely depending on activity to regulate interpersonal and intrapersonal anxieties. Research investigating the anxiolytic effect of ultra-endurance running suggests that 74% (*n* = 1349) of participants would not stop running even if continuing would endanger their health, as the psychological benefits were too important to risk losing (Hoffman & Krouse, 2018). We encourage future research to investigate the balance between the emotion regulation benefits of activity attachment and the risk of injury through excessive activity participation.

**Separation anxiety**

In the wake of a temporary separation from their activity, all participants expressed distress and concern for their wellbeing. These concerns surrounded having “a much lower threshold to deal with the challenges of life” and subsequent risk of becoming "depressed". Such accounts support Bowlby’s (1969) notion that separating from attachment figures derives concerns for individuals’ wellbeing and ability to cope with distress. Therefore, it is unsurprising that participants’ separation anxiety gave rise to proximity maintenance behaviour towards their activity domains. In addition, participants sought to protect their activity relationships by engaging in several protective behaviours to combat injury, illness, physical deterioration, and logistical issues.

**Conclusion**

 We have provided theoretical arguments and preliminary evidence supporting the notion that attachment theory offers a promising framework to examine and understand human-activity relationships. Our findings highlight the potential that activity has for helping people feel a sense of safety and security while dealing with distress and social insecurity. Although this preliminary evidence is convincing, this research is in its infancy and offers many directions for further inquiry. Future research should examine whether athletes’ sporting attachments hold any therapeutic value when buffering against the detrimental effects of insecure social relationships. Although some participants could not make optimal use of their interpersonal relationships as a base for exploration, they displayed organized strategies for regulating emotions in times of distress by seeking their activity. Thus, using activity as a compensatory attachment may be an adaptive response to insecure social attachments. There are also several caveats and limitations to acknowledge and address in future research. Firstly, these results represent the lived experiences and perceptions of a very small group of elite athletes and are not generalizable to the larger activity population. Investigating larger populations using informatively developed measures is needed to understand this phenomenon's scope. Such research would help shed light on the activity-attachment-based emotion regulation processes our findings imply and their potential therapeutic effects.

 Overall, our findings demonstrate the important role that activities play in fulfilling individuals’ attachment needs, such as providing a *secure base* and *safe haven* and eliciting *separation anxiety* and *proximity maintenance* behaviours, congruent with attachment theory (Haven & Zeifman, 1994). Expanding the scope of attachment theory into human activity relationships invites questions regarding the affective regulation effects of activity attachments and how they interact with social attachments.

**Chapter 4: Shelter me from the storm: An attachment perspective on individuals’ relationship with their activities[[6]](#footnote-6)**

**Abstract**

Researchers have recently reported that individuals approach their animals, objects, and activities for attachment support similar to that experienced in interpersonal relationships (Keefer & Rothschild, 2020; Willegers & Woodman, 2022). This paper explores the degree to which individuals use their attachment to activities to compensate for insecure attachments in interpersonal relationships – the *Compensatory Hypothesis*. At present, there is no scale that captures the support human-nonhuman attachments provide according to Bowlby's (1980) notion of an attachment and exploratory behavioural system. In Study 1 (*n* = 286), we developed such a scale. We found excellent model fit and psychometric properties for the four-factor Relationship Attachment Support Scale (RASS; safe haven, secure base, proximity maintenance, and separation distress) and the six-factor Relationship Exploratory Support Scale (RESS; security in exploration, emotion regulation, personal reflection, development, self-expression, and self-esteem) across both activity and interpersonal relationships. In Study 2, we used these scales to test the *Compensatory Hypothesis.* Moderation regression analysis using PROCESS revealed that the emotion regulation transfer benefits of individuals' activity attachments significantly reduced the negative relationship between insecure interpersonal attachment and wellbeing. The findings from this paper provide valuable insight into the emotion regulation role of activity attachments for individuals with insecure interpersonal attachments. We urge researchers to consider the broader application of the RASS and RESS to investigate the emotion regulation function that other human-nonhuman attachments might serve.

**Introduction**

Using Bowlby's (1969) interpersonal attachment theory, researchers have begun investigating the meaningful relationships humans develop with nonhuman agents (Keefer et al., 2014). At the centre of this research arose important considerations concerning the ability of nonhuman agents to fulfil human attachment needs and represent legitimate attachment agents. Research in this area has not yet fully explored the degree to which Bowlby's (1973) interpersonal attachment theory maps on to human-nonhuman relationships or the purpose of developing attachments with nonhuman agents (Keefer, Landau & Sullivan, 2014).

Recent research by Willegers and Woodman (2022) has shown that physical activities can play an essential role in the provision of individuals’ attachment needs (i.e., sporting activities provide a secure base and safe haven from distress). Their results show that athletes developed secure beliefs regarding the availability and effectiveness of their activity attachments compared to the insecurities that they felt toward close others. These preliminary results supported the *Compensatory Hypothesis* stating that individuals seek support from other agents as a means of compensating for lack of social support (Keefer et al., 2014). The present paper aims to explore how people use their activity attachments to attenuate their insecure interpersonal attachments' negative effects on their wellbeing. With no suitable measure in the existing literature, the initial challenge was to create new scales that could measure the attachment and exploratory functioning of individuals’ activity attachments. In Study 1, we aimed to develop the Relationship Attachment and Exploratory Support Scales needed to test the *Compensatory Hypothesis.* In Study 2, we aimed to use these scales to test the *Compensatory Hypothesis* – that individuals’ activity attachments can attenuate the negative effects of insecure interpersonal attachments on wellbeing.

**Attachment Theory**

For decades researchers have emphasized the importance of social relationships for supporting wellbeing and development (Maslow, 1943; Ryff, 1989). Bowlby's (1969) attachment theory proposes that strong relationships with others promote healthy development and wellbeing in part by fulfilling individuals' attachment needs. In order to ensure safety and optimal development, Bowlby (1980) argued that humans seek relationships that provide a *safe haven* from distress and a *secure base* from which to explore. Bowlby (1980) proposed two behavioural systems that guide humans’ interactions with others. Firstly, he proposed the behavioural attachment system, which activates when one is distressed and needs others for comfort. Finally, he proposed the exploratory behaviour system, which activates when one needs stimulation. Researchers have since suggested that our social relationships' supportiveness, availability, and responsiveness shape our attachment and exploratory behaviours (Mikulincer & Shaver, 2007). Secure attachment relationships support healthy development by supporting individuals' needs for comfort and security. This social support increases individuals' exploration in pursuit of personal growth by minimizing uncertainties toward others and the external world (Mikulincer & Shaver, 2007). Individuals' pervasive sense of security around others leaves positive footprints on the mental representations of the self and others, corresponding to what Bowlby (1973) termed positive *internal working models* (IWMs) or secure attachments. These IWMs influence our beliefs about our self-worth and whether others will support us, guiding our attachment behaviours toward others (Collins & Read, 1990). In contrast, experiencing others as unsupportive and inconsistent leads to the formation of negative IWMs of the self (i.e., I am unworthy of care and others cannot be trusted to provide care; Bowlby, 1973). These expectations reflect two forms of insecure attachment and correspond with maladaptive emotion regulation strategies and poorer wellbeing (Shaver, Schachner & Mikulincer, 2005). Anxiously attached individuals fear that others will not support them, which results in exaggerated responses to distress and clinging behaviours to reduce their worries (Mikulincer & Shaver, 2007). Avoidantly attached individuals have pessimistic expectations of others’ ability to provide support and therefore dismiss social support to avoid close relationships (Shaver et al., 2005).

An essential function of IWMs or attachment styles is that they enable individuals to project established mental representations of previous relationships onto new relationships that either solidify or revise existing beliefs over time (Collin & Read, 1990). Consequently, early IWM representations significantly influence individuals’ social emotion regulation strategies in new relationships (Bowlby, 1969, 1973, 1980; West, Mathews & Kern, 2013). Typically, insecure attachments correspond with clingy or avoidant behaviour, impairing individuals' ability to regulate distressing emotions undermining their wellbeing and exploratory behaviours (Shaver et al., 2016). Thus, anxious and avoidant attachments deprive individuals of the adaptive intrapersonal and interpersonal emotion regulation strategies necessary to maintain wellbeing (Mikulincer & Shaver, 2016). In contrast, research suggests that secure relationships correspond with positive social and emotional development, goal pursuit and achievement, and greater self-esteem, resilience, and wellbeing (Feeney & Van Vleet, 2010; Potter, 2016).

**Nonhuman attachment figures**

Using the conceptual framework of attachment theory, researchers have begun to explore the attachment relationships that humans develop with nonhuman agents (Bowlby, 1973; Keefer et al., 2014). Growing research suggests that nonhuman agents can fulfil the same attachment needs originally reserved for interpersonal relationships (Keefer et al., 2014). Specifically, nonhuman agents such as deities, pets, objects, fictional characters, media persona, buildings, and places have served as a safe haven and secure base for individuals (Keefer, 2016). Although this research indicates the potential attachment function these agents serve, theoretical inconsistencies remain in defining attachment relationships (see Beck & Madresh, 2008). Indeed, researchers need a clear definition of an attachment relationship to identify genuine attachment relationships in future research. Hazan and Zeifman (1994) proposed behaviours that genuine attachment relationships support. Specifically, they suggested that attachment relationships provide a *secure base* from which to glean a sense of comfort, a *safe haven* in times of distress, derive *proximity maintenance* behaviours that result in a sense of safety and enjoyment, and have their absence derive a sense of *separation anxiety*. However, only a few researchers have utilized this clear definition when investigating nonhuman agents' capacity to provide attachment support (see Carr & Rockett, 2017; Rockett & Carr, 2014).

**The Compensatory Hypothesis**

The compensatory hypothesis states that individuals will seek support from nonhuman agents to compensate for lack of social support (Keefer et al., 2014). Empirical research has since supported the compensatory hypothesis suggesting that attachments to pets and objects can buffer against the detrimental effects of insecure interpersonal relationships (Granqvist & Hagekull, 1999; Keefer & Rothschild, 2020; Kwong & Bartholomew, 2011). In addition, these nonhuman agents' controllable and predictable nature means they are deemed more dependable than humans (Keefer & Rothschild, 2020). Consequently, nonhuman relationships can serve individuals' needs unconditionally, making these agentic relationships ideal for safeguarding against the insecurities individuals feel toward interpersonal relationships.

In a recent study, Willegers and Woodman (2022) found that activity attachments helped athletes cope with insecure interpersonal attachments by assisting them in regulating challenging emotions. Specifically, the emotion regulation benefits (i.e., ability to reflect and regulate emotions) of athletes' activity attachments helped them manage their interpersonal and intrapersonal anxieties. Willegers and Woodman’s (2022) preliminary findings highlighted two activity attachment strategies for managing interpersonal and intrapersonal difficulties. Firstly, athletes reported using the emotion regulation strategies (i.e., personal reflection and reappraisal) they developed in their activity attachments to regulate their interpersonal anxieties as they unfolded. That is, athletes used activity attachment-based emotion regulation strategies to *directly* attenuate their anxiety in their interpersonal domain (*direct compensation strategy*). Lastly, athletes used their activity domain as a safe haven from interpersonal and intrapersonal difficulties. In other words, athletes would leave their anxiety-provoking situation to seek out their sporting domain for comfort (*escape strategy*). These results give us some insight into the underlying processes that drive compensatory relationships. However, there is no quantitative evidence to support the compensatory attachment function activities may serve, or indeed the *escape* (i.e., safe-haven support) and *direct* *compensation strategies* (i.e., transfer of activity attachment emotion regulation strategies to the interpersonal domain) that may underlie any such benefit.

**Measuring attachment and exploratory support**

We can draw only tentative conclusions from this literature to date for several reasons. Firstly, research investigating activity attachment has drawn conclusions based on the experiences of a small group of participants, limiting the generalizability of their findings (i.e., Willegers & Woodman, 2022). Secondly, researchers have typically adapted human-focused scales and items (i.e., *I can count on my dog's trustworthiness*,Kurdek, 2008; Nedelisky & Steele, 2009) to investigate nonhuman attachment. However, we question the relevance of concepts such as *trustworthiness* when investigating individuals' attachment to non-living agents (i.e., objects, activities). Further to this, there are currently no measures that capture the exploratory support individuals might receive from their nonhuman attachments (i.e., *I feel better able to challenge myself knowing that I have a secure base to return to*). As such, the nonhuman attachment scales available in the literature do not account for Bowlby's (1980) notion of an exploratory behavioural system.

In conclusion, no scales in the available literature can measure the attachment and exploratory support provided by any human or nonhuman agent (i.e., an agent-flexible measure). The absence of an agent-flexible attachment and exploratory support measure has hampered our understanding of individuals’ nonhuman attachments and the *compensatory* support they provide. Thus, there remains a need for an agent-flexible scale that measures both attachment and exploratory support, following Bowlby's (1980) notion of an attachment and exploration behavioural system.

**Aims**

The purpose of the present research is to investigate the compensatory function activity attachments serve. Specifically, we aim to investigate the *direct* *compensation* (i.e., transfer of activity attachment emotion regulation strategies to the interpersonal domain) and *escape* (using the activity domain as a safe haven)compensatory function activity attachments may serve in attenuating the negative relationship between insecure interpersonal attachment on wellbeing. In doing so, we aim to provide initial support for activities as an attachment compensation strategy for individuals with anxious and avoidant interpersonal attachment beliefs and pave the way for more in-depth research into this area. In the absence of a suitable measure in the existing literature, the initial challenge was to create new scales that could measure both the attachment and exploratory function of individuals’ activity attachments.

**Study 1**

**Development of a new inventory**

At present, there is no scale that captures the attachment and exploratory support that individuals draw from their activities in accordance with Bowlby's (1980) notion of an attachment and exploratory behavioural system. To that end, we aimed to develop scales that can measure the attachment and exploratory support of any specified relationship (i.e., activity, object, pet, or human attachment as specified by the researchers’ interest). We subsequently aimed to support these scales' factor structure and model fit across individuals' activity attachment relationships and their closest interpersonal attachment relationships. When conceptualizing relationships as attachments, we focused on the degree to which these relationships provided a *secure base*, *safe haven*, and derived *proximity maintenance* and *separation distress* (Hazan & Zeifman, 1994). Therefore, the Relationship Attachment Support Scale (RASS) items aimed to assess the degree to which individuals’ relationship with any specified agent (i.e., partner, activity) fulfilled these four fundamental attachment functions. We used Bowlby's (1980) notion of an exploratory behavioural system, Ainsworth and Bell’s (1974) concept of sensitivity (i.e., non-interference and acceptance), Grossman et al.’s (2002) notion of exploratory support, and Willegers and Woodman’s (2022) exploratory behaviours within interpersonal and activity relationships to develop the Relationship Exploration Support Scale (RESS) items. This literature asserts that sensitive agents promote *security in exploration* and *development* by supporting individuals’ *self-efficacy* and *emotion regulation* ability, facilitating *personal reflection* and *self-expressive* behaviours (i.e., exploratory behaviours). Thus, the items in the RESS aimed to assess the extent to which any specified relationship supports these six exploration factors.

Measuring attachment styles has become synonymous with attachment research and identifies individuals' insecure beliefs toward others' loyalty, love, and availability (Fraley et al., 2011; Zilcha-Mano et al., 2011). However, it is difficult to imagine non-living agents, such as an activity, acting in an insecure manner that may lead to insecure beliefs. Willegers and Woodman’s (2022) findings support this notion in which the security of athletes’ relationship with their sport was less a function of the sport itself and primarily a function of the athletes' behaviour (i.e., an agentic relationship). Consequently, items capturing one’s insecure beliefs, such as "*I am afraid this person may abandon me*” were deemed unsuitable for exploring the nature of individuals’ activity attachments. Thus, we aimed to develop items that assess the attachment and exploratory behaviours relationships support rather than individuals’ insecure beliefs towards their relationships (Bowlby, 1980; Hazan & Zeifman, 1994).

**Method**

**Participants**

We first sought to test and to refine the four-factor Relationship Attachment Support Scale and six-factor Relationship Exploratory Support Scale by recruiting 286 participants (159 men, 126 women, 1 other; *M*age *=* 41.36, *SD =* 14.86; *M*years’ participation = 14.67, *SD* = 13.68; single 74, committed relationship 203, unsure 9) who participated in a variety of physical activities (i.e., running, mountain biking, climbing, gymnastics, athletics).

**Item development and content validity**

 Based on Bowlby's (1980) notion of an attachment and exploratory behavioural system, existing measures of attachment support (Ainsworth & Bell, 1974; Grossman et al., 2002; Potter, 2016), and Willegers and Woodman’s (2022) qualitative activity attachment findings, we developed two pools of items measuring attachment and exploratory support. Firstly, we developed 90 Relationship Attachment Support Scale (RASS) items measuring *secure base*, *safe haven*, *separation distress*, and *proximity maintenance* behaviours. Secondly, we developed 67 Relationship Exploratory Support Scale (RESS) items measuring *security in exploration*, *self-efficacy*, *emotion regulation*, *personal reflection*, *self-expression*, and *development* support. We developed all the items so that the attachment figure that the item refers to could be changed easily. For example, the item “*If I have concerns or worries, I usually seek out my partner for comfort”* can be adapted to measure the safe haven support that one’s activity provides – “*If I have concerns or worries, I usually seek out my preferred activity for comfort.* We worded all the items to help researchers measure the attachment and exploratory support for any agent of interest.

The subfactors of both the RASS and RESS (i.e., introduction, scale, and items) were then externally assessed by ten world-leading experts in the field of attachment and affective science. First, the experts assessed each component and item on how well it served its intended function on a Likert scale from 1 (*the item is irrelevant and therefore unsuitable*) to 5 (*the item is extremely suitable for its given purpose*). Each expert then provided written feedback on any modifications to improve the scales. This feedback was then discussed and acted upon before sending out the amended scales for a second independent expert review (sampling eight experts). Based on both rounds of expert evaluation, we selected the best scoring items for each scale.

**Measures**

**Relationship Attachment Support Scale**

The four-factor Relationship Attachment Support Scale (RASS) consists of seven *secure-base* items (i.e., *I can count on* [Insert attachment figure here] *to be there no matter what*), seven *safe-haven* items (i.e., *If I have concerns or worries, I usually seek out my* [Insert attachment figure here] *for comfort*), seven *separation distress* items (i.e., *When I’m away from* [insert attachment figure here] *for a while I start to feel more anxious*), and seven *proximity maintenance* items (i.e., *I like being close to* [Insert attachment figure here]). Participants completed each item twice, once in relation to their preferred activity [inserted “my preferred activity” into attachment items] and once in relation to their closest interpersonal relationship [inserted “this person” into attachment items] as specified by them (see Tables 1 and 3). Participants responded on a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

**Relationship Exploration Support Scale**

 The six-factor Relationship Exploration Support Scale (RESS) consists of four *security in exploration* items (i.e., *Knowing that I have* [Insert attachment figure here] *to fall back on helps me to take on other challenges in life*), four *self-expression* items (i.e., *I feel comfortable exploring ways I can express myself when* [Insert attachment figure here]), five *emotion regulation* items (i.e., *I feel better able to deal with difficult emotions in everyday life thanks to my experiences with/in* [Insert attachment figure here]), five *personal reflection* items (i.e., [Insert attachment figure here] *helps me to explore my feelings*), five *development* items (i.e., [Insert attachment figure here] *has helped me to shape who I am*), and five *self-esteem* items (i.e., [Insert attachment figure here] *makes me feel more able to succeed in life*). Participants completed each item twice, once in relation to their preferred activity [inserted “my preferred activity” into attachment items] and once in relation to their closest interpersonal relationship [inserted “this person” into attachment items] as specified by them (see Tables 2 and 4). Participants responded on a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

**Convergent and discriminant validity**

We used the following scales to assess the convergent and discriminant validity of the RASS and RESS with similar psychometric constructs and health outcomes.

**Leisure Satisfaction Scale [[7]](#footnote-7)**

We used four relaxation items (i.e., *my leisure activity contributes to my emotional wellbeing*) measured on a Likert scale from 1 (*almost never true*) to 5 (*almost always true*) from Beard and Ragheb’s (1980) Leisure Satisfaction Scale.

**Activity Involvement Scale**

Nine items from Kyle et al.’s (2006) Activity Involvement Scale measured attraction (*My preferred activity is very important to me*), centrality (i.e., *I find a lot of my life is organized around my preferred activity*), and identity affirmation (i.e., *When I participate in my preferred activity I can really be myself*) on a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

**Relative Importance Scale**

Two items from the Relative Importance subscale measured the relative importance (i.e., *My activity is the most important thing in my life*) of individuals’ activities on a 1 (*strongly disagree*) to 5 (*strongly agree*) Likert scale (Hardy et al., 2017).

**The Experience in Close Relationships – Relationship Structure**

The Experience in Close Relationships – Relationship Structure (ECR-RS) questionnaire measured individuals' attachment-related avoidance and anxious belief toward their current closest interpersonal relationship (Fraley et al., 2011). Participants responded to six avoidance items (i.e., *I don't feel comfortable opening up to this person*) and three anxious items (i.e., *I often worry that this person doesn't really care for me*) in relation to their current closest interpersonal relationship (which they specified) on a scale of 1 (*strongly disagree*) to 7 *(strongly agree*).

**Wellbeing**

The WHO-Five Well-being Index (WHO-5) measured individuals’ psychological and physical wellbeing over the past two weeks (World Health Organisation, 2017). Participants rated five items on a Likert scale ranging from 0 (*at no time*) to 5 (*all of the time*).

**Self-esteem**

We administered Rosenberg’s self-esteem scale (RSES; Rosenberg 1965), which comprises ten items (i.e., *I take a positive attitude toward myself*) scored on a Likert scale from 1 (*strongly disagree)* to 4 (*strongly agree*).

**Procedure**

We combined all inventories into an online survey (Qualtrics, 2012). Participants completed the Qualtrics online survey via several online media outlets (i.e., Facebook and relevant forums). Participants opened the welcome page via the Qualtrics online URL link explaining the nature of the study and the privacy regulations in place to manage and protect their data. Participants provided informed consent and demographic data before completing the study measures and opted into a £100 prize draw upon completion (i.e., participation incentive). The entire process took approximately 25 minutes to complete. The institutional ethics committee provided ethical approval.

**Sample size**

Our sample size (*n* = 286) represented a small sample for models with 28 indicators (10 subjects per item; Lee & Song, 2004). This sample size conforms with common practice when adopting a Bayesian approach in analyzing structural equation models with small sample sizes (Kruschke, Aguinis & Joo, 2012). Thus, we deemed our sample sufficiently large to support stable posterior distributions and parameter estimates (Kruschke, Aguinis & Joo, 2012; Muthén & Asparouhov, 2012).

**Factorial validity**

We conducted several Bayesian structural equation models (BSEM) to test the factor structure, model fit, and rigor of both the RASS and RESS across both activity and human agents. The limitations of applying a conventional confirmatory factor analysis (CFA) using maximum likelihood estimation to impose an independent cluster model (ICM) are well documented (see Asparouhov & Muthén, 2010). BSEM allows researchers to assess the factor validity of an identified model with fewer restrictions than ICM-CFA (Muthén & Asparouhov, 2012). For example, researchers can specify zero mean and small variance priors on cross-loadings and residual correlations within an identified model, resulting in more realistic parameter estimates (Lee & Song, 2004; Muthén & Asparouhov, 2012).

 We estimated the following BSEM models in Mplus version 8.5 for each attachment end exploratory scale. Models included noninformative priors for major loadings and informative approximate zero cross-loading and exact zero residuals. We used noninformative for major loading because this was the first study to test these new scales. Consequently, no prior factor loading estimates were available, and therefore we specified prior variances for cross-loadings and residual correlations at N (0, 0.01). We standardized indicators and factors, representing factor loadings and residual correlations with a 95% limit of -.20 and +.20 (i.e., small cross-loadings and residual variances; Muthén & Asparouhov, 2012). Following Depaoli and Van de Schoot’s (2017) WAMBS checklist (When to worry and how to Avoid the Misuse of Bayesian Statistics) and Asparouhov and Muthén’s (2015) recommendations, we assessed the stability of the models by varying the variance of the priors, as this can influence parameter estimates. Subsequently, we re-analyzed each model specifying prior variances at .005 and .015 and compared these estimates with those from a prior variance of .01 (see Appendix A for Mplus Syntax).

**Internal consistency, discriminant validity, and convergent validity**

Using McDonald’s omega, we assessed the internal consistency of the RASS and RESS across both activity and interpersonal agents (SPSS OMEGA macro, Hayes & Coutts, 2020). We tested whether the measures displayed the expected relationships between their subfactors and measures of interpersonal attachment, activity involvement, wellbeing, and self-esteem to establish convergent and divergent validity. Using latent variable correlations from the BSEM analysis, we assessed the relationships among the scale subfactors. Finally, we assessed the relationships between scales and their corresponding subfactors by reviewing correlations among the measures.

**Results[[8]](#footnote-8)**

**BSEM Analysis**

We assessed each model using the same convergence and fit criteria (see Depaoli & Van de Schoot, 2017). Each parameter trace plot displayed considerable overlap indicating that the parameters had converged on their posterior distribution. Additionally, we did not consider autocorrelation large enough to warrant concern, < 0.2 (Kruschke, 2013). We observed relatively smooth changes between adjacent frequency bars across all histograms, suggesting that the posterior distributions were well represented (Depaoli & Van de Schoot, 2017). With a sample of 286 participants, the following posterior predictive p-value (PPP) estimates with prior variances specified at N(0, 0.01) were reported across both activity and closest interpersonal agent: RASS - activity *PPP* = .510; RASS – interpersonal *PPP* = .547; RESS - activity *PPP* = .612; RESS – interpersonal *PPP* = .622. All PPP estimates were above .05 and close to .5, with potential scale reduction factor (PSRF) estimates between 1.0 and 1.1, indicating adequate Markov Chain Monte Carlo (MCMC) convergence and a well-fitting model (Gelman & Rubin, 1992). Standardized major loading suggested that items loaded well onto their intended factors (i.e., > .4; Ford, MacCallum, & Tait, 1986) with trivial insignificant cross-loading (< 0.2) across all scales (see Tables 1-4). Only two items from the initial 30-item RESS proved to be poor indicators for their intended factors across both activity and interpersonal agents (Security in exploration *item - 'I know if I encounter problems in life, I can return to my activity for reassurance and comfort',* RESS - activity .32[-.09,.75], RESS – interpersonal .40[.03,.82]; Self-expressive item - *'This person has little influence on how I express myself in life',* RESS - activity .41[-.01,.83], RESS – interpersonal .41[-.10,.89]). Since the null hypothesis was credible (95% CIs including zero) for three of these loadings, these items did not feature in the RESS or subsequent analyses.

Altering our prior variances from .01 to .005 and .015, for the most part, did not result in any meaningful change in the convergence, parameter estimates, and fit of the models, indicating low prior variance sensitivity (factor loading relative deviation between .1% and 13%) and a robust fitting model (Muthén & Asparouhov, 2012). Item three from the RESS – interpersonal indicated moderate prior sensitivity, resulting in a 95% CI including zero. Specifically, this item *'Knowing that I have this person to fall back on helps me to take on other challenges in life*' reported the following factor loadings and CIs; RESS – interpersonal, (-0.0,01) .44[.04,.90], (-0.0,02) .32[-.06,.87] suggesting that the null hypothesis was credible for the latter loading (Asparouhov & Muthén, 2010). Although these results call into question the prior sensitivity of the item, the item was retained based on its external validity and performance across the other scales. Additionally, a few items displayed relative deviation (RD) > 13% on major loading estimates across our larger (.01) and smaller (.005) priors, respectively; RESS – interpersonal, SE-3 .44-.58, RD 32.5%; D-3 .47-.58, RD 24.31%.

Although major item-factor loading estimates remained relatively stable across our diffuse priors, we observed large deviations in our cross-loading estimates ranging from 0% to 333% deviation (RESS - activity, PR-3 with DA, prior .01, -.003, prior .005, .007, RD 333%). However, none of the scale cross-loadings escaped their priori limits of ±.20 or altered the interpretation of the model results.

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| **Table 1** Relationship Attachment Support Scale-Activity Standardized Factor loadings with 95% credibility intervals [in brackets].  |
| Item | Separation Distress | Safe Haven | Proximity Maintenance  | Secure Base |
| If I couldn’t participate in my preferred sport/activity for a long time I would become concerned for my wellbeing | **.92 [.85,1]** | -.05 [-.20 .08] | -.03 [-.18 .10] | -.06 [-.21 .07] |
| Small problems start to overwhelm me when I haven’t had the time to participate in my preferred sport/activity  | **.85 [.66,1]** | .00 [-.14 .15] | -.06 [-.22 .08] | -.02 [-.17 .11] |
| I become concerned for my wellbeing when I can’t participate in my preferred sport/activity  | **.86 [.681,1]** | -.05 [-.20 .09] | -.04 [-.20 .11] | .03 [-.11 .17] |
| I find it difficult being away from my preferred sport/activity for extended periods  | **.59 [.41,.78]** | .04 [-.10 .18] | .14 [-.02 .29] | .08 [-.05 .22] |
| When I’m away from my preferred sport/activity for a while I start to feel more anxious  | **.78 [.60,.95]** | -.00 [-.15 .13] | .03 [-.11 .18] | -.00 [-.14 .12] |
| Being away from my preferred sport/activity for extended periods negatively affects me | **.76 [.58,.93]** | -.02 [-.16 .11] | .11 [-.04 .25] | -.02 [-.16 .11] |
| When I haven’t participated in my preferred sport/activity for a while I feel less able to deal with problems in life  | **.82 [.65,.98]** | .08 [-.05 .22] | -.08 [-.23 .05] | .01 [-.11 .14] |
| If I have concerns or worries, I usually seek out my preferred sport/activity for comfort  | -.03 [-.17 .09] | **.93 [.86,1]** | -.04 [-.19 .08] | -.02 [-.16 .10] |
| When I feel upset, I can rely on my preferred sport/activity to help me feel better  | -.04 [-.19 .10] | **.75 [.55,.94]** | .04 [-.11 .20] | .02 [-.13 .17] |
| When I am unhappy in life I turn to my preferred sport/activity to help me feel better  | .07 [-.06 .21] | **.81 [.65,.99]** | .00 [-.14 .14] | -.03 [-.17 .10] |
| Participating in my preferred sport/activity helps me reappraise things I am worried about  | -.03 [-.19 .12] | **.74 [.49,.96]** | -.01 [-.17 .14] | -.01 [-.17 .14] |
| If I have a worry or concern, participating in my preferred sport/activity helps me to think about it differently  | -.01 [-.16 .12] | **.75 [.53,.95]** | -.02 [-.17 .12] | .03 [-.12 .17] |
| I feel I am better able to deal with problems when I have had time to participate in my preferred sport/activity  | .06 [-.09 .21] | **.57 [.35,.79]** | .08 [-.07 .24] | .05 [-.10 .21] |
| Participating in my preferred sport/activity helps bring a sense of clarity to problems I am facing  | -.03 [-.18 .11] | **.76 [.55,.96]** | -.02 [-.17 .13] | .00 [-.14 .15] |
| I feel more relaxed when I can easily access my preferred sport/activity  | -.08 [-.24 .06] | -.07 [-.23 .08] | **.93 [.85,1]**  | -.10 [-.26 .04] |
| Being close to my sport/activity domain is very important to me  | .01 [-.14 .16] | .09 [-.06 .24] | **.62 [.38,.85]**  | .04 [-.11 .19] |
| I like being close to my preferred sport/activity domain  | -.06 [-.23 .10] | -.06 [-.23 .10] | **.71 [.43,.96]**  | -.00 [-.17 .15] |
| I feel more comfortable in myself when I have access to my preferred sport/activity  | .13 [-.03 .29] | .09 [-.06 .24] | **.57 [.34,.81]**  | .05 [-.09 .20] |
| I have shaped my life so I can easily access my preferred sport/activity  | -.03 [-.20 .13] | .00 [-.16 .17] | **.49 [.20,.76]**  | .12 [-.05 .28] |
| I feel more comfortable living somewhere where I have access to my preferred sport/activity  | .04 [-.12 .20] | .00 [-.15 .16] | **.62 [.35,.87]**  | -.02 [-.18 .13] |
| Having close access to my preferred sport/activity is very important to me  | .07 [-.08 .23] | .00 [-.15 .15] | **.65 [.42,.88]**  | .02 [-.12 .17] |
| Ever since I started, my preferred sport/activity has had a stable presence in my life  | -.09 [-.25 .06] | -.10 [-.26 .04] | -.09 [-.25 .06] | **.92 [.84,1]** |
| I find it comforting knowing that my preferred sport/activity will always be there for me  | -.02 [-.17 .12] | .04 [-.12 .19] | .03 [-.12 .19] | **.73 [.52,.93]** |
| My relationship with my preferred sport/activity is secure  | -.03 [-.19 .12] | -.05 [-.22 .12] | -.01 [-.18 .15] | **.63 [.34,.87]** |
| I can count on my preferred sport/activity to be there no matter what  | -.03 [-.19 .12] | -.02 [-.19 .14] | -.08 [-.25 .07] | **.71 [.45,.94]** |
| I feel a sense of comfort knowing that my preferred sport/activity will be there for me when I need it  | .00 [-.14 .15] | .02 [-.13 .18] | .03 [-.12 .19] | **.67 [.45,.88]** |
| My preferred sport/activity brings a sense of security to my life  | .11 [-.03 .26] | .10 [-.06 .26] | .08 [-.08 .24] | **.47 [.24,.70]** |
| I feel a sense of comfort knowing that I can participate in my preferred sport/activity when I need to  | .09 [-.06 .24] | .06 [-.11 .22] | .06 [-.11 .22] | **.55 [.32,.80]** |
| Note: Loadings and 95% CIs on intended factors in bold text. |

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| **Table 2**Relationship Exploration Support Scale-Activity Standardized Factor loadings with 95% credibility intervals [in brackets]. |
| Item | Security in Exploration | Emotion Regulation | Personal Reflection | Development | Self-Expression | Self Efficacy |
| My preferred sport/activity has helped me to become more adventurous in other areas of life  | **.95 [.87,1]**  | -.05 [-.21 .11] | .01 [-.14 .17] | -.03 [-.19 .12] | -.04 [-.21 .11] | -.08 [-.25 .07] |
| My preferred sport/activity has helped me explore areas in life that I otherwise wouldn’t have explored  | **.87 [.60,1]**  | -.04 [-.22 .12] | -.08 [-.24 .06] | -.01 [-.18 .15] | .00 [-.17 .17] | -.01 [-.19 .16] |
| Knowing that I have my preferred sport/activity to fall back on helps me to take on other challenges in life  | **.46 [.14,.81]**  | .08 [-.09 .26] | .12 [-.03 .28] | -.03 [-.20 .14] | .12 [-.06 .30] | .02 [-.16 .21] |
| My involvement in my preferred sport/activity has helped me strive to achieve personal goals  | **.64 [.32,.98]**  | .01 [-.17 .19] | -.04 [-.20 .12] | .06 [-.11 .25] | -.06 [-.24 .11] | .09 [-.10 .29] |
| I feel better able to deal with difficult emotions in everyday life thanks to my experiences in my preferred sport/activity  | .04 [-.12 .19] | **.96 [.88,1]**  | -.05 [-.20 .09] | -.06 [-.21 .09] | -.06 [-.22 .09] | -.04 [-.21 .11] |
| My preferred sport/activity has helped me feel more in control of my emotions in other challenging situations  | -.05 [-.21 .11] | **.80 [.52,1]**  | .03 [-.14 .20] | .05 [-.12 .21] | -.02 [-.19 .13] | -.01 [-.18 .16] |
| I feel better able to deal with challenges and setbacks in life due to my experiences in my preferred sport/activity  | .02 [-.12 .17] | **.72 [.46,.99]**  | -.03 [-.19 .11] | .04 [-.10 .19] | .06 [-.09 .21] | .05 [-.11 .21] |
| My experiences in my preferred sport/activity help me to persist when the going gets tough in life  | -.00 [-.17 .15] | **.72 [.41,1]**  | .00 [-.17 .16] | .01 [-.15 .18] | .00-.16 .17] | .03 [-.14 .21] |
| My preferred sport/activity makes me feel as though I could overcome difficult emotions  | -.03 [-.19 .12] | **.78 [.49,1]**  | .07 [-.11 .23] | -.02 [-.19 .13] | .02 [-.14 .18] | -.01 [-.19 .15] |
| My preferred sport/activity helps me to think about how I am feeling  | -.04 [-.19 .11] | -.40 [-.19 .10] | **.96 [.89,1]**  | -.04 [-.20 .11] | -.07 [-.22 .07] | -.00-.17 .15] |
| My preferred sport/activity helps me to explore my feelings  | -.02 [-.17 .12] | -.03 [-.21 .13] | **.88 [.70,1]**  | -.02 [-.17 .13] | .02 [-.14 .17] | -.04 [-.20 .11] |
| My preferred sport/activity helps me to reflect on other challenges I am facing  | .04 [-.10 .20] | .07 [-.10 .25] | **.67 [.47,.87]**  | -.00 [-.15 .15] | .00 [-.15 .16] | .07 [-.08 .23] |
| My preferred sport/activity helps me to reflect on how I feel deep down  | -.02 [-.17 .12] | .02 [-.14 .19] | **.84 [.66,1]**  | .02 [-.12 .17] | -.00 [-.16 .14] | -.02 [-.18 .13] |
| My preferred sport/activity makes me feel more able to explore my feelings | .05 [-.09 .20] | -.01 [-.18 .15] | **.78 [.60,.98]**  | .03 [-.11 .18] | .03 [-.12 .18] | -.01 [-.17 .14] |
| My life wouldn’t look much different without my preferred sport/activity  | -.08 [-.25 .08] | -.07 [-.24 .09] | -.07 [-.24 .09] | **.96 [.88,1]**  | -.09 [-.26 .07] | -.09 [-.26 .06] |
| My preferred sport/activity has taught me a lot about myself  | .03 [ -.13 .20] | .04 [-.13 .22] | .09 [-.06 .24] | **.54 [.25,.85]**  | .06 [-.10 .23] | .02 [-.15 .20] |
| My preferred sport/activity helps me to be the person I truly want to be  | .03 [-.13 .19] | .06 [-.10 .23] | .02 [-.12 .18] | **.58 [.31,.86]**  | .05 [-.11 .21] | .07 [-.10 .24] |
| My preferred sport/activity has helped me develop as a person  | .06 [-.10 .22] | .03 [-.13 .20] | .01 [-.13 .16] | **.67 [.43,.94]**  | .00 [-.15 .16] | .05 [-.12 .22] |
| My preferred sport/activity has helped me to shape who I am  | .02 [-.15 .19] | -.03 [.21 .14] | -.02 [-.18 .13] | **.77 [.50,1]**  | .03 [-.14 .20] | .00 [-.18 .18] |
| I feel comfortable exploring ways I can express myself when participating in my preferred sport/activity  | .04 [-.12 .20] | -.07 [-.24 .08] | -.07 [-.23 .08] | -.05 [-.21 .11] | **.96 [.88,1]**  | -.05 [-.22 .11] |
| I feel able to express myself when I am participating in my preferred sport/activity  | -.01 [-.19 .15] |  .00 [-.17 .18] |  .00 [-.16 .16] | -.00 [-.17 .16] | **.76 [.46,1]**  | .00 [-.17 .18] |
| I feel I am free to be myself when I am participating in my preferred sport/activity  | -.05 [-.23 .12] | .02 [-.16 .20] |  .02 [-.15 .19] | .06 [-.11 .24] | **.63 [.27,.98]**  | .01 [-.17 .20] |
| My preferred sport/activity has given me the confidence to express myself how I want to in life beyond my sport/activity  |  .04 [-.12 .20] | .09 [-.07 .26] |  .07 [-.08 .22] | .06 [-.09 .22] | **.50 [.25,.79]**  | .10 [-.07 .27] |
| My preferred sport/activity makes me feel more confident in myself  |  -.03 [-.20 .12] |  -.09 [-.25 .07] |  -.03 [-.20 .12] | -.05 [-.21 .10] | -.03 [-.20 .13] | **.96 [.88,1]**  |
| The confidence I have gained from my preferred sport/activity helps me in other areas in life  |  .03 [-.13 .18] |  .03 [-.13 .20] |  -.01 [-.16 .12] | .10 [-.06 .25] | -.05 [-.21 .09] | **.77 [.52,1]**  |
| My preferred sport/activity makes me feel more able to succeed in life  |  .00 [-.16 .17] | .04 [-.13 .21] |  .07 [-.07 .22] | .05 [-.12 .22] | .06 [-.11 .22] | **.61 [.31,.94]**  |
| My preferred sport/activity has given me confidence in my abilities when taking on new challenges  |  .08 [-.09 .25] | .08 [-.10 .25] |  .03 [-.10 .18] | -.03 [-.20 .13] | .08 [-.08 .24] | **.61 [.31,.94]**  |
| My preferred sport/activity makes me feel less capable in my abilities  | -.03 [-.22 .16] | -.03 [-.22 .15] | -.06 [-.23 .11] | -.04 [-.24 .15] | .00 [-.19 .19] | **.54 [.09,.94]**  |
| Note: Loadings and 95% Cis on intended factors in bold text. |

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| **Table 3**Relationship Attachment Support Scale-Interpersonal Standardized Factor loadings with 95% credibility intervals [in brackets].  |
| Item  | Separation Distress | Safe Haven | Proximity Maintenance  | Secure Base |
| If I couldn’t see this person for a long time, I would become concerned for my wellbeing.  | **.92 [.85,1]** | -.05 [-.21 .09] | -.05 [-.20 .08] | .00 [-.14 .15] |
| Small problems start to overwhelm me when I haven’t had the time to see this person  | **.71 [.47,.94]** | .04 [-.13 .21] | -.04 [-.22 .12] | -.02 [-.18 .14] |
| I become concerned for my wellbeing when I can’t see this person  | **.88 [.71,1]** | -.06 [-.22 .08] | .00 [-.16 .16] | -.03 [-.18 .10] |
| I find it difficult being away from this person for extended periods  | **.80 [.60,1]** | .01 [-.15 .16] | -.01 [-.18 .14] | .02 [-.13 .17] |
| When I’m away from this person for a while I start to feel more anxious  | **.85 [.66,1]** | -.02 [-.18 .12] | .01 [-.15 .17] | -.05 [-.20 .08] |
| Being away from this person for extended periods negatively affects me. | **.69 [.52,.87]** | .07 [-.07 .21] | .09 [-.06 .25] | -.01 [-.15 .13] |
| When I haven’t seen this person for a while, I feel less able to deal with problems in life  | **.78 [.58,.98]** | .00 [-.15 .16] | -.03 [-.20 .13] | .00 [-.14 .15] |
| If I have concerns or worries, I usually seek out this person for comfort  | -.01 [-.16 .12] | **.94 [.87,1]** | -.03 [-.18 .11] | -.07 [-.22 .06] |
| When I feel upset, I can rely on this person to help me feel better  | -.06 [-.20 .08] | **.77 [.54,1]** | .01 [-.15 .17] | .07 [-.09 .23] |
| When I am unhappy in life, I turn to this person to help me feel better  | .04 [-.09 .18] | **.78 [.58,1]** | .02 [-.13 .17] | .01 [-.14 .16] |
| Seeing this person helps me reappraise things I am worried about  | -.04 [-.19 .10] | **.90 [.66,1]** | -.08 [-.24 .08] | -.01 [-.18 .14] |
| If I have a worry or concern, this person helps me to think about it differently  | -.02 [-.17 .13] | **.77 [.52,1]** | -.00 [-.18 .15] | -.01 [-.17 .15] |
| I feel I am better able to deal with problems when I have had time to see this person  | .11 [-.04 .25] | **.65 [.41,.89]** | .06 [-.10 .22] | .00 [-.16 .16] |
| This person helps bring a sense of clarity to problems I am facing  | .01 [-.13 .15] | **.72 [.50,.94]** | .04 [-.11 .20] | .06 [-.10 .21] |
| I feel more relaxed when I can easily see this person  | -.03 [-.18 .11] | -.05 [-.21 .09] | **.94 [.87,1]** | -.12 [-.28 .02] |
| Being close to this person is very important to me  | -.04 [-.19 .10] | .08 [-.08 .23] | **.81 [.57,1]** | -.00 [-.17 .14] |
| I like being close to this person  | -.03 [-.20 .12] | .03 [-.14 .20] | **.75 [.48,1]** | .04 [-.12 .21] |
| I feel more comfortable in myself when I have access to this person  | .09 [-.08 .25] | .04 [-.13 .21] | **.58 [.32,.86]** | .10 [-.07 .27] |
| I have shaped my life so I can easily see this person  | .04 [-.11 .19] | -.03 [-.19 .12] | **.69 [.44,.94]** | .05 [-.11 .21] |
| I feel more comfortable living somewhere where I have access to this person  | -.00 [-.16 .15] | -.00 [-.17 .16] | **.79 [.53,1]** | -.01 [-.18 .14] |
| Having close access to this person is very important to me  | .09 [-.04 .23] | .00 [-.13 .14] | **.65 [.45,.85]** | .10 [-.03 .24] |
| Ever since our relationship started, this person has had a stable presence in my life  | -.08 [-.24 .06] | -.09 [-.24 .05] | -.09 [-.24 .06] | **.95 [.88,1]** |
| I find it comforting knowing that this person will always be there for me  | .00 [-.14 .15] | .11 [-.06 .28] | .03 [-.14 .19] | **.66 [.44,.90]** |
| My relationship with this person is secure  | -.02 [-.17 .12] | -.01 [-.19 .14] | -.02 [-.19 .14] | **.84 [.61,1]** |
| I can count on this person to be there no matter what  | .00 [-.15 .15] | -.05 [-.22 .11] | -.05 [-.23 .11] | **.82 [.58,1]** |
| I feel a sense of comfort knowing that this person will be there for me when I need them  | .00 [-.13 .14] | .09 [-.07 .24] | .08 [-.08 .24] | **.69 [.49,.90]** |
| This person brings a sense of security to my life  | .06 [-.07 .20] | -.00 [-.17 .15] | .10 [-.06 .27] | **.69 [.48,.91]** |
| I feel a sense of comfort knowing that I can see this person when I need to  | .06 [-.08 .21] | .07 [-.10 .24] | .06 [-.11 .23] | **.62 [.39,.87]** |
| Note: Loadings and 95% CIs on intended factors in bold text. |

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| **Table 4** Relationship Exploration Support Scale-Interpersonal Standardized Factor loadings with 95% credibility intervals [in brackets]. |
| Item  | Security in Exploration | Emotion Regulation | Personal Reflection | Development | Self-Expression | Self Efficacy |
| This person has helped me to become more adventurous in other areas of life  | **.97 [.89,1]** | -.08 [-.26 .08] | -.07 [-.24 .09] | -.08 [-.25 .09] | -.03 [-.20 .14] | -.05 [-.22 .11] |
| This person has helped me explore areas in life that I otherwise wouldn’t have explored  | **.78 [.47,1]** | -.00[ -.19 .17] | -.02 [-.19 .14] | .04 [-.14 .21] | -.02 [-.20 .15] | -.03 [-.22 .15] |
| Knowing that I have this person to fall back on helps me to take on other challenges in life  | **.44 [.04,.90]** | .13 [-.07 .33] | .07[ -.11 .25] | .02 [-.16 .21] | .08 [-.11 .26] | .06 [-.14 .26] |
| My involvement with this person has helped me strive to achieve personal goals  | **.55 [.20,.95]** | .04 [-.14 .23] | .07 [-.10 .25] | .04 [-.13 .23] | .02 [-.16 .20] | .08 [-.12 .28] |
| I feel better able to deal with difficult emotions in everyday life thanks to my experiences with this person  | .04 [-.11 .19] | **.97 [.90,1]** | -.03 [-.19 .11] | -.03 [-.19 .12] | -.05 [-.22 .10] | -.04 [-.21 .12] |
| This person has helped me feel more in control of my emotions in other challenging situations  | .00 [-.16 .17] | **.77 [.43,1]** | .05 [-.12 .23] | .02 [-.16 .19] | -.02 [-.21 .14] | -.01 [-.19 .17] |
| I feel better able to deal with challenges and setbacks in life due to my experiences with this person  | .01 [-.15 .18] | **.64 [.29,1]** | -.03 [-.21 .13] | .12 [-.06 .30] | .05 [-.13 .23] | .04 [-.14 .22] |
| My experiences with this person help me to persist when the going gets tough in life  | -.03 [-.21 .13] | **.85 [.48,1]** | -.04 [-.22 .13] | -.02 [-.21 .15] | .00 [-.17 .19] | -.01 [-.20 .17] |
| This person makes me feel as though I could overcome difficult emotions  | -.03 [-.21 .13] | **.79 [.44,1]** | .04 [-.14 .22] | -.04 [-.22 .13] | .04 [-.14 .22] | .01 [-.17 .19] |
| This person helps me to think about how I am feeling  | -.02 [-.19 .13] | -.01 [-.18 .14] | **.97 [.90,1]** | -.03 [-.19 .13] | -.07 [-.23 .08] | -.03 [-.20 .12] |
| This person helps me to explore my feelings  | -.02 [-.18 .12] | -.00 [-.17 .16] | **.88 [.66,1]** | .01 [-.14 .16] | .03 [-.13 .19] | -.04 [-.22 .12] |
| This person helps me to reflect on other challenges I am facing  | .07 [-.09 .23] | .02 [-.15 .20] | **.63 [.37,.93]** | .01 [-.15 .17] | .05 [-.12 .22] | .09 [-.09 .27] |
| This person helps me to reflect on how I feel deep down  | -.01 [-.16 .13] | .00 [-.16 .17] | **.83 [.61,1]** | .01 [-.14 .17] | .02 [-.13 .18] | -.00 [-.18 .16] |
| This person makes me feel more able to explore my feelings | .02 [-.13 .18] | -.00 [-.18 .17] | **.79 [.53,1]** | .00 [-.16 .17] | -.01 [-.18 .15] | .03 [-.15 .20] |
| My life wouldn’t look much different without this person  | -.08 [-.26 .09] | -.10 [-.27 .07] | -.10 [-.28 .07] | **.98 [.80,1]** | -.11 [-.29 .06] | -.11 [-.29 .05] |
| This person has taught me a lot about myself  | .00 [-.17 .18] | .05 [-.13 .24] | .03 [-.14 .21] | **.68 [.37,1]** | .02 [-.15 .20] | .01 [-.17 .20] |
| This person helps me to be the person I truly want to be  | .07 [-.09 .23] | .07 [-.11 .25] | .07 [-.10 .23] | **.47 [.18,.84]** | .09 [-.08 .26] | .12 [-.07 .30] |
| This person has helped me develop as a person | .04 [-.12 .21] | .04 [-.13 .22] | .06 [-.10 .23] | **.57 [.29,.90]** | .08 [-.09 .25] | .06 [-.12 .24] |
| This person has helped me to shape who I am  | .00 [-.18 .17] | -.03[ -.21 .15] | -.01 [-.19 .16] | **.84 [.52,1]** | -.03 [-.21 .14] | -.00 [ -.19 .17] |
| I feel comfortable exploring ways I can express myself when I am with this person  | .03 [-.14 .20] | -.07 [-.24 .09] | -.05 [-.22 .10] | -.10 [-.27 .06] | **.97 [.89,1]** | -.04 [-.21 .12] |
| I feel able to express myself when I am with this person  | -.04 [-.21 .13] | .00 [-.18 .18] | .02 [-.15 .19] | .03 [-.13 .20] | **.79 [.48,1]** | .00 [-.18 .18] |
| I feel I am free to be myself when I am with this person  | -.04 [-.22 .12] | .00 [-.18 .18] | -.01 [-.19 .16] | .04 [-.14 .21] | **.79 [.45,1]** | .00 [-.19 .18] |
| This person has given me the confidence to express myself how I want to in life beyond our relationship  | .07 [-.10 .24] | .09 [-.10 .27] | .04 [-.13 .21] | .05 [-.11 .22] | **.56 [.24,.94]** | .03 [-.15 .21] |
| This person makes me feel more confident in myself  | -.06 [-.22 .08] | -.04 [-.21 .11] | .00 [-.14 .16] | -.08 [-.23 .07] | .04 [-.12 .19] | **.97 [.90,1]** |
| The confidence I have gained from this person helps me in other areas in life  | .00 [-.16 .16] | .00 [-.16 .18] | -.02 [-.19 .13] | .05 [-.11 .22] | -.00 [-.17 .16] | **.82 [.51,1]** |
| This person makes me feel more able to succeed in life  | .01 [-.15 .18] | .04 [-.13 .22] | -.01 [-.17 .15] | .04 [-.13 .20] | -.03 [-.20 .13] | **.78 [.46,1]** |
| This person has given me confidence in my abilities when taking on new challenges  | .09 [-.10 .25] | -.01 [-.19 .16] | .02 [-.15 .18] | .04 [-.13 .21] | -.02 [-.19 .15] | **.76 [.42,1]** |
| This person makes me feel less capable in my abilities  | .00 [-.196 .19] | -.01 [-.20 .18] | -.01 [-.20 .17] | -.03 [-.23 .15] | -.01 [-.21 .18] | **.65 [.21,1]** |
| Note: Loadings and 95% CIs on intended factors in bold text. |

**Internal consistency and latent factor intercorrelations**

Tables 5-8 show the latent factor means, standard deviations, McDonald’s omega, and latent factor intercorrelations for the RASS across activity and interpersonal agents. All subfactors demonstrated acceptable internal consistency. For both the RASS, all subfactors (i.e., separation distress, safe haven, proximity maintenance and secure base) were strongly positively intercorrelated. None of the 95% credibility intervals encompassed unity suggesting discriminant validity of these subfactors concerning one another.

For the RESS across activity and interpersonal agents, all subfactors (i.e., security in exploration, emotion regulation, personal reflection, development, self-expression, and self-efficacy) were strongly positively intercorrelated. Furthermore, none of the 95% credibility intervals encompassed unity indicating subfactor divergence.

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| **Table 5** Means, SDs, McDonald’s omega (ω), latent factor inter-correlations and their 95% credibility intervals [in brackets] for the RASS activity. |
|  | *M* | *SD* |  ω | Separation distress  | Safe haven | Proximity maintenance | Secure base |
| Separation distress | 37.65 | 8.52 | .91 |  |  |  |  |
| Safe haven | 39.45 | 6.71 | .89 | .68[.56,.78]\* |  |  |  |
| Proximity maintenance | 42.86 | 4.95 | .85 | .73[.60,.82]\* | .67[.53,.78]\* |  |  |
| Secure base | 39.91 | 5.89 | .83 | .59[.43,.72]\* | .71[.57,.80]\* | .66[.50,.78]\* |  |

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| **Table 6** Means, SDs, McDonald’s omega (ω), latent factor inter-correlations, and their 95% credibility intervals [in brackets] for the RESS activity. |
|  | *M* | *SD* |  ω | Security in exploration | Emotion regulation | Personal reflection | Development  | Self-expression |
| Security in exploration | 22.97 | 3.79 | .76 |  |  |  |  |  |
| Emotion regulation | 27.60 | 4.98 | .88 | .66[47,.79]\* |  |  |  |  |
| Personal reflection | 25.84 | 5.74 | .90 | .50[.28,.66]\* | .77[.63,.85]\* |  |  |  |
| Development  | 26.85 | 6.21 | .80 | .67[.49,.79]\* | .70[.53,.81]\* | .51[.30,.67]\* |  |  |
| Self-expression  | 22.64 | 3.46 | .75 | .65[.48,.78]\* | .68[.51,.80]\* | .62[.43,.75]\* | .51[.30,.67]\* |  |
| Self-efficacy | 29.49 | 3.82 | .81 | .72[.55,.84]\* | .77[.62,.86]\* | .54[.35,.70]\* | .74[.59,.84]\* | .69[.51,.81]\* |

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| **Table 7** Means, SDs, McDonald’s omega (ω), latent factor inter-correlations, and the 95% credibility intervals [in brackets] for the RASS interpersonal. |
|  | *M* | *SD* |  ω | Separation distress  | Safe haven | Proximity maintenance | Secure base |
| Separation distress | 34.92 | 8.67 | .91 |  |  |  |  |
| Safe haven | 39.94 | 6.25 | .91 | .71[.59,.80]\* |  |  |  |
| Proximity maintenance | 41.35 | 6.76 | .91 | .79[.69,.86]\* | .80[.70,.86]\* |  |  |
| Secure base | 42.38 | 6.02 | .90 | .65[.51,.76]\* | .80[.71,.87]\* | .80[.69,.87]\* |  |

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| **Table 8**Means, SDs, McDonald’s omega (ω), latent factor inter-correlations, and the 95% credibility intervals [in brackets] for the RESS interpersonal. |
|  | *M* | *SD* |  ω | Security in exploration | Emotion regulation | Personal reflection | Development  | Self-expression |
| Security in exploration | 22.01 | 3.92 | .78 |  |  |  |  |  |
| Emotion regulation | 27.96 | 4.69 | .89 | .72[49,.85]\* |  |  |  |  |
| Personal reflection | 27.19 | 5.11 | .91 | .66[.45,.80]\* | .82[.72,.89]\* |  |  |  |
| Development  | 28.97 | 4.49 | .82 | .67[.45,.82]\* | .81[.66,.89]\* | .72[.56,.84]\* |  |  |
| Self-expression  | 22.07 | 3.67 | .78 | .70[.50,.83]\* | .81[.68,.89]\* | .76[.63,.86]\* | .71[.52,.84]\* |  |
| Self-efficacy | 28.70 | 4.53 | .88 | .78[.58,.89]\* | .85[.75,.91]\* | .80[.69,.88]\* | .79[.64,.89]\* | .83[.71,.89]\* |

**Convergent and divergent validity**

Table 9 shows the bivariate correlations among the RASS and RESS across activity and interpersonal agents and measures of leisure satisfaction/relaxation, activity involvement (attraction, centrality, identity affirmation), relative importance, anxious attachment, avoidant attachment, wellbeing, and self-esteem. The RASS - activity and RESS - activity subfactors showed moderate to strong positive correlations with one another (*p* < .001). We observed the same between the RASS – interpersonal and RESS – interpersonal subfactors (*p* < .001), indicating convergent validity between the attachment and exploratory scales. The RASS- activity and RESS- activity subfactors positively correlated (*p* < .01) with measures of activity involvement, relative activity importance, leisure satisfaction, attraction, centrality, and identity affirmation, indicating cross-measure convergent validity. With the exception of the RASS – interpersonal separation distress and RESS interpersonal self-efficacy subscales (*p* > .05), the remaining subscales revealed significant (*p* < .001) weak to strong negative correlations with avoidant and anxious attachment, indicating cross measure divergent validity. Consistent with prior research, anxious and avoidant attachment negatively correlated with wellbeing and self-esteem (*p* < .05).

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| **Table 9**McDonald’s omega, bivariate correlations between RASS and RESS interpersonal and activity scores and measures of activity involvement, attachment style, self-esteem, and wellbeing. |
| Variable |  1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1.Activity RASS | — |  |  |  |  |  |  |  |  |  |  |  |
| 2.Activity RESS | .67 \*\*\* | — |  |  |  |  |  |  |  |  |  |  |
| 3.Interpersonal RASS | .13\* | .14\* | — |  |  |  |  |  |  |  |  |  |
| 4.Interpersonal RESS | .16\*\* | .41\*\*\* | .76\*\*\* | — |  |  |  |  |  |  |  |  |
| 5.Leisure relaxation | .46\*\*\* | .29\*\*\* | .1\*\* | .18\*\* | .80 |  |  |  |  |  |  |  |
| 6.Attraction | .39\*\*\* | .3\*\*\* | .09 | .16\*\* | .34\*\*\* | .50 |  |  |  |  |  |  |
| 7.Central | .47\*\*\* | .42\*\*\* | .0 | .0 | .22\*\*\* | .59\*\*\* | .84 |  |  |  |  |  |
| 8.Identity affirmation | .37\*\*\* | .42\*\*\* | -.02 | .1\* | .34\*\*\* | .49\*\*\* | .34\*\*\* | .45 |  |  |  |  |
| 9.Relative importance | .40\*\*\* | .32\*\*\* | -.17\*\* | -.14\* | .05 | .38\*\*\* | .45\*\*\* | .34\*\*\* | .82 |  |  |  |
| 10.Self-esteem | -.07 | .09 | .06 | .11 | .06 | -.00 | -.02 | .10 | -.06 | .91 |  |  |
| 11.Well-being | -.1\* | .0 | -.03 | .01 | -.05 | -.04 | .04 | .10 | -.01 | .53\*\*\* | .86 |  |
| 12.Avoidance | .05 | -.09 | -.57\*\*\* | -.55\*\*\* | -.09 | -.05 | .01 | -.02 | .09 | -.31\*\*\* | -.13\* | .75 |
| 13.Anxiety | .10 | -.01 | -.24\*\*\* | -.24\*\*\* | -.05 | -.02 | .06 | -.00 | .16\*\* | -.37\*\*\* | -.27\*\*\* | .39\*\*\* .79 |
| Note: \* *p* < .05, \*\* p <.01, \*\*\* p <.001, McDonald’s omega coefficients are on the diagonal. |

**Discussion**

This study aimed to develop new scales – the Relationship Attachment Support Scale and Relationship Exploration Support Scale – to measure the attachment and exploratory support that individuals experience in their activity and interpersonal relationships. In summary, the four-factor RASS and six-factor RESS displayed good factorial validity and expected latent factor intercorrelations across individuals’ activity and close interpersonal relationships. Furthermore, the scales displayed convergent validity across markers of activity relaxation, exploration, development, and insecure interpersonal attachment styles. These findings provided initial support for the psychometric properties of the RASS and RESS in both interpersonal and activity activity-based relationships.

**Study 2**

In Study 2 we used the Relationship Attachment Support Scale and Relationship Exploration Support Scale to investigate the *compensatory hypothesis* that individuals' activity attachments will attenuate the negative relationship between insecure interpersonal attachment and wellbeing (Keefer et al., 2014). We were interested in whether individuals’ activity attachment can buffer against the negative effects of insecure interpersonal attachments on wellbeing.

In their qualitative study, Willegers and Woodman (2022) reveal two activity attachment processes that helped athletes deal with interpersonal insecurities and intrapersonal difficulties. Firstly, athletes transferred the emotion regulation strategies they used in their activity attachments to regulate their anxieties in their interpersonal and daily life domains. In other words, athletes' activity attachment experiences helped them overcome interpersonal and personal challenges in situ by implementing the emotion regulation strategies they exercised in their activity. For example, some athletes used personal reflection and reappraisal strategies to help them reflect upon and overcome interpersonal and intrapersonal challenges as they occurred (Willegers & Woodman, 2022). This process represents a *direct compensation strateg*y for managing the difficulties these athletes experienced in their interpersonal environment and intrapersonal lives.

Secondly, athletes used their activity domain as a safe haven to temporarily alleviate interpersonal and intrapersonal distress. This process represents an ***escape strategy*** in which athletes retreat away from anxiety-provoking environments to the comfort of their sporting environment. Despite athletes' claims that using their sport as a safe haven from interpersonal insecurity is effective, these temporary safe haven benefits did not address their underlying interpersonal and intrapersonal issues. Since athletes' activity safe haven benefits are tied to the activity domain, using sport as a safe haven could not directly attenuate their anxiety in interpersonal and daily life domains. Therefore, relying solely on sports to escape interpersonal insecurity would leave these athletes facing the challenge of returning to an unchanged interpersonal environment that undermined their wellbeing.

Research has repeatedly shown that using early response-based emotion regulation strategies is more effective at altering the nature of emotions and their adverse effects than using late response-based strategies (Gross, 2015; Webb, Miles & Sheeran, 2012). Accordingly, implementing activity attachment-based emotion regulation strategies in the interpersonal domain (early *direct compensatory strategy*) may be more effective at mitigating the negative effects insecure relationships have on wellbeing than using activities as a safe haven (late *escape* *strategy*). Thus, we suggest that the *direct compensatory strategies* (i.e., personal reflection and reappraisal) discussed above may be a key moderator in the relationship between insecure attachment and wellbeing. Therefore, we were particularly interested in the direct moderating effects of the RESS-emotion regulation (*'I feel better able to deal with difficult emotions in everyday life thanks to my experiences in my preferred activity*) and personal reflection (*'My preferred sport/activity* *helps me to reflect on other challenges I am facing*') subscales on the relationship between insecure interpersonal attachment and wellbeing.

 **Compensatory hypothesis.** We hypothesized that the emotion regulation transfer benefits (*emotion regulation*, *personal reflection* subscales) of participants’ activities would attenuate the negative relationship between insecure (*anxious* and *avoidant*) interpersonal attachment and wellbeing (*direct compensation strategy*). Specifically, we will see a significantly greater reduction in the negative relationship between insecure interpersonal attachment and wellbeing for individuals relatively high in activity *emotion regulation* and *personal reflection* transfer benefits than those low in activity emotion regulation transfer benefits. In contrast, we hypothesized that the *safe haven* function of participants’ activities would not significantly moderate the relationship between insecure interpersonal attachment and wellbeing (*escape strategy*).

**Method**

**Participants**

In Study 2 (*n* = 286), we used the same data collected in Study 1.

**Analyses**

We used SPSS (IBM, Armonk, NY) and Hayes’s (2012) PROCESS macro to estimate the moderation models. Further to this, PROCESS macro allowed probing of the interaction using Johnson-Neyman procedures. Using PROCESS, we investigated the hypothesized moderator of participants' activity emotion regulation function on the relationship between insecure interpersonal attachment and wellbeing. This analysis allowed us to probe the insecure attachment × activity emotion regulation transfer interaction.

**Results[[9]](#footnote-9)**

**Preliminary analysis**

Paired sample *t*-tests revealed significant differences in the attachment and exploratory support individuals experienced in their activity attachments and closest interpersonal attachments. Specifically, in their activity relationship compared to their relationship with their closest other, participants experienced greater: *separation distress*, *t*(285) = 4.71, *p* < .001, Cohen’s d = .27; *proximity maintenance behaviours*, *t*(285) = 3.09, *p* <.01, Cohen’s d = .18; *self-efficacy benefits*, *t*(285) = 3.65, *p* < .01, Cohen’s d = .21; and *security in exploration*, *t*(285) = 3.01, *p* < .01, Cohen’s d = .17. Conversely, participants reported their closest other as a greater source for fulfilling their *secure base* *t*(285) = -5.22, *p* < .01, Cohen’s d = -.30), *personal reflection* *t*(285) = -3.60, *p* < .01, Cohen’s d = -.21), and *development needs* *t*(285) = -5.04, *p* < .01, Cohen’s d = -.29) compared to their activity relationship. The remaining Relationship Attachment Support Scale and Relationship Exploratory Support Scale subfactors revealed no significant differences between participants’ activity and interpersonal relationship.

**Main analysis**

 The PROCESS (Hayes, 2012) results provided support for the compensatory hypothesis that participants' activity emotion regulation transfer benefits moderate the negative relationship between insecure interpersonal attachment and wellbeing.As hypothesized, the moderation analyses revealed that individuals high in activity emotion regulation transfer benefits (i.e., *personal reflection* and *emotion regulation* subscales) experienced a significantly greater reduction in the negative relationship between insecure interpersonal attachment and wellbeing than individuals low in activity emotion regulation transfer benefits (See Table 10 & Figures 1-4). Conversely, the *safe haven* subscale of individuals' activity attachments did not significantly moderate the relationship between insecure interpersonal attachment and wellbeing.

For the sake of completeness, we investigated this moderation relationship across the remaining RASS and RESS subscales. Our moderation analysis revealed that the activity RESS total attenuated the negative relationship between insecure interpersonal attachment and wellbeing (*anxious* interpersonal attachment *p* = .02 and *avoidant* interpersonal attachment marginal support *p* < .06). Furthermore, the activity RESS *self-efficacy* subscale moderated the relationship between avoidant attachment and wellbeing (*p* = .03). Conversely, the remaining RASS and RESS subfactors did not significantly moderate the relationship between insecure interpersonal attachment and wellbeing.

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| **Table 10**Models testing the hypothesized interaction between insecure interpersonal attachment (anxiety/avoidance) and activity attachment (RESS support) on wellbeing.  |
|  |  *b* (*SE*) | *t* | *p* |
| Intercept | 53.92 (1.11) | 48.48 | <.001 |
|  Anxiety  | -1.48 (.29) | -5.08 | <.001 |
|  Activity emotion regulation support  | .30 (.23) | 1.30 | .19 |
|  Anxiety × activity emotion regulation support | .11 (.05) | 2.15 | .03 |
|  R2 = .09 |   |  |  |
| Intercept | 53.81(1.11) | 48.39 | <.001 |
|  Anxiety  | -1.51(.28) | -5.22 | <.001 |
|  Activity personal reflection support | 0.28(.20) | 1.39 | .16 |
|  Anxiety × activity personal reflection support | 0.14(.04) | 2.96 | <.01 |
|  R2 = .10 |  |  |  |
| Intercept | 54.02(1.11) | 48.48 | <.001 |
|  Anxiety  | -1.46(.28) | -5.09 | <.001 |
|  RESS total | 0.05(.05) | 1.09 | .27 |
|  Anxiety × RESS total | 0.02(.01) | 2.22 | .02 |
|  R2 = .09 |   |  |  |
| Intercept | 54.12(1.14) | 47.45 | <.001 |
|  Avoidance | -.48(.20) | -2.40 | .01 |
|  Activity emotion regulation support | .30(.24) | 1.25 | .21 |
|  Avoidance × activity emotion regulation support | .09(.04) | 2.41 | .01 |
|  R2 = .04 |   |  |  |
| Intercept | 54.36(1.15) | 47.27 | <.001 |
|  Avoidance | -.44(.20) | -2.10 | .03 |
|  Activity self-efficacy support | .17(.28) | .60 | .54 |
|  Avoidance × activity self-efficacy support | .10(.05) | 2.12 | .03 |
|  R2 = .03 |  |  |  |
| Intercept | 54.00(1.14) | 47.01 | <.001 |
|  Avoidance | -.50(.21) | -2.41 | .01 |
|  Activity personal reflection support | .21(.21) | 1.00 | .31 |
|  Avoidance × activity personal reflection support | .07(.03) | 1.94 | .052 |
|  R2 = .03 |  |  |  |
| Intercept | 54.16(1.14) | 47.49 | <.001 |
|  Avoidance | -.46(.20) | -2.25 | .02 |
|  RESS total | .05(.05) | 1.04 | .29 |
|  Avoidance × RESS total | .01(.00) | 1.88 | .059 |
|  R2 = .03 |  |  |  |

**Figure 1**

The moderating effect of activity emotion regulation support on the relationship between human avoidant attachment and wellbeing.

Note: Low = 1 *SD* below the mean, High = 1 *SD* above the mean.

**Figure 2**

The moderating effect of activity emotion regulation support on the relationship between human anxious attachment and wellbeing.





Note: Low = -1SD below the mean, High = +1SD above the mean.

**Figure 3**

The moderating effect of activity personal reflection support on the relationship between human avoidant attachment and wellbeing.





Note: Low = -1SD below the mean, High = +1SD above the mean.

**Figure 4**

The moderating effect of activity personal reflection support on the relationship between human anxious attachment and wellbeing.



Note: Low = -1SD below the mean, High = +1SD above the mean.

**Discussion**

In Study 2, we aimed to explore the emotion regulation transfer effects of activity attachment on the relationship between insecure interpersonal attachment and wellbeing. Consistent with our hypothesis, the emotion regulation and personal reflection transfer effects of participants’ activities had a moderating effect on the relationship between insecure interpersonal attachment and wellbeing. Specifically, we found that those who experienced an emotion regulation and personal reflection transfer benefit from their activity to their daily lives significantly decreased the negative effects of insecure interpersonal attachments on wellbeing. The exploratory emotion regulation function (RESS subscales) of individuals’ activity attachments drove this finding, namely, individuals’ ability to reflect on their emotions and regulate distressing emotions elsewhere due to their activity attachment experiences.

These findings affirm athletes' reports that their activities prompted effective emotion regulation strategies (i.e., personal reflection and reappraisal) that helped them manage their emotions when dealing with interpersonal and intrapersonal difficulties (Willegers & Woodman, 2022). Specifically, individuals were able to transfer their activity attachment emotion regulation strategies back into their interpersonal (*emotion regulation* subscale, *'I feel better able to deal with difficult emotions in everyday life thanks to my experiences in my preferred activity*') and intrapersonal lives (*personal reflection* subscale, *'My preferred activity helps me to reflect on other challenges I am facing*'). Consequently, the emotion regulation transfer benefits of individuals' activity attachments have therapeutic value for those who lack secure social relationships.

On the other hand, the safe haven function of individuals' activity attachments did not significantly moderate the relationship between insecure interpersonal attachment and wellbeing. These results affirm our assertion that using activity as a *safe haven* (*escape response-based emotion regulation strategies*) would not be a key moderator of this relationship. Overall, these findings support the compensatory hypothesis and offer valuable insights into the emotion regulation function activity attachments serve in reducing the negative effects insecure interpersonal attachments inflict on wellbeing (Keefer et al., 2014).

**General discussion**

The aim of the present research was twofold: (a) to provide preliminary support for the *compensatory hypothesis* that activity attachment support will attenuate the negative relationship between insecure interpersonal attachment and wellbeing; and (b) to develop the scales capable of measuring the attachment and exploratory support individuals glean from their activity and interpersonal relationships. As an interchangeable scale of interpersonal and human-nonhuman attachment and exploratory support did not exist, we first developed these scales. We then tested our *compensatory hypothesis* using these scales.

In Study 1, we developed and validated the four-factor Relationship Attachment Support Scale (RASS; *secure base*, *safe haven*, *proximity maintenance*, *separation distress*) and six-factor Relationship Exploratory Support Scale (RESS; *security in exploration*, *development*, *personal reflection*, *emotion regulation*, *self-esteem*, *self-expression*) across both human and sport activity agents. We designed each item to measure its intended construct in relation to a specified agent. Therefore, researchers can measure the attachment, and exploratory support individuals glean from any specified relationship (i.e., parent, partner, activity). We validated these scales across individuals' closest interpersonal relationships and their preferred activity as specified by them. Using the flexibility of BSEMs, the developed scales revealed excellent model fit and factorial validity across both interpersonal and activity relationships (Depaoli & Van de Schoot, 2017). In addition, the scale subfactors revealed the expected inter-factor correlations and bivariate correlations with related constructures. Collectively, these findings provided initial support for the psychometric properties of the scales and their ability to measure the attachment and exploratory functioning of individuals’ interpersonal and activity relationships.

We developed the RASS and RESS to measure any relationship's attachment and exploratory functioning and used these scales specifically to test the compensatory hypothesis regarding interpersonal and activity relationships. Researchers interested in directly comparing interpersonal relationships and any other relationship will find these scales particularly useful. Thus, the RASS and RESS extend beyond attachment style research (i.e., individuals' anxious and avoidant beliefs toward others, Fraley et al., 2011) by measuring the attachment and exploratory behaviours specific relationships support (i.e., *If I have concerns or worries, I usually seek out my preferred activity for comfort*). These scales would be instrumental in measuring the impacts of attachment-based interventions upon attachment and exploratory behaviour within specific relationships. Thus, the present research offers a methodologically valid avenue for investigating the behavioural impacts of individuals' attachment relationships beyond their anxious and avoidant social beliefs.

**Compensatory relationships**

In Study 2, we used the data collected from these scales to test the *compensatory hypothesis* that activity attachment emotion regulation transfer benefits would moderate the relationship between insecure interpersonal attachment and wellbeing. Consistent with our hypothesis, participants who used their activity emotion regulation strategies to handle their interpersonal and intrapersonal difficulties experienced a significantly greater reduction in the negative relationship between insecure interpersonal attachment and wellbeing. Our research demonstrates for the first time that individuals' activity attachments can buffer against the negative effects induced by social insecurity by bolstering one's ability to reflect and regulate their emotions in their intrapersonal and interpersonal domain.

Furthermore, our study investigated the effectiveness of using *direct* *compensation* and *escape* activity emotion regulation strategies to weaken the negative insecure interpersonal attachment - wellbeing relationship. Specifically, participants could manage their interpersonal and intrapersonal difficulties by either using their activity emotion regulation strategies in their interpersonal and intrapersonal lives (early *direct compensation strategy*) or seeking their activity domain as a safe haven (late *escape strategy*). Our finds support athletes' reports (see Willegers & Woodman, 2022) that using the emotion regulation strategies their activity attachments supported (i.e., personal reflection and reappraisal) helped them reappraise and overcome interpersonal and intrapersonal challenges as they arose.

Conversely, using activity as a form of escapism from distress did not help reduce interpersonal and intrapersonal difficulties in situ (Willegers & Woodman, 2022). Instead, athletes would leave the safety of their activity domain to return to an interpersonal environment that undermined their wellbeing. The findings of this paper extend beyond previous literature (Keefer & Rothschild, 2020; Willegers & Woodman, 2022), suggesting that transferring individuals' activity emotion regulation strategies to their interpersonal domains (early *direct compensator strategy*) is a key moderator in attenuating the negative effects insecure relationships inflict on individuals’ wellbeing than using their activity as a safe haven (late *escape strategy*).

This finding is consistent with previous literature (Webb, Miles & Sheeran, 2012) investigating the effects of different emotion regulation strategies on individuals’ wellbeing. Specifically, this literature suggests that the earlier individuals apply emotion regulation strategies to manage negative emotions, the less impact those emotions have on their wellbeing (i.e., reduce emotional snowballing, Gross, 2015). It is likely that participants who reflect on their emotions and use emotion regulation strategies such as reappraisal in their interpersonal domain improve the outcomes of these interactions. Research has demonstrated that engaging in reappraisal strategies during interpersonal conflict reduces the intensity and duration of individuals' negative emotions and their associated wellbeing costs (English, John & Gross, 2013). Thus, applying activity attachment-based emotion regulation strategies in the interpersonal domain may change how individuals appraise their insecure interpersonal interactions and create smoother, more enjoyable interactions. On the other hand, using activity as a safe haven is not likely to improve the nature of individuals' insecure interpersonal interactions or beliefs when they emerge. Consequently, using an escape response-based attachment strategy such as this may allow negative emotions to gain momentum (i.e., snowballing, Gross, 2015) and reduce individuals’ wellbeing while they wait for the opportunity to engage in their activity.

This initial investigation focused solely on the extent to which activity attachments helped individuals explore and identify their feelings (*personal reflection* subscale) and regulate challenging emotions in their interpersonal and intrapersonal lives (*emotion regulation* subscale). Consequently, the RESS subscales do not identify the specific emotion regulation strategies participants transferred from their activity attachments to their interpersonal and intrapersonal lives. Further research is needed to explore the mechanisms that underpin the emotion regulation transfer benefits activity attachments promote. Future research would do well to apply Gross's (2015) process model of emotion regulation and relevant measurements (i.e., Emotion Regulation Questionnaire, Gross & John, 2003) in the field of nonhuman attachment. This research would help us better understand the underlying emotion regulation strategies activity promotes and how well these strategies transfer into individuals' interpersonal and intrapersonal lives. In doing so, we may identify other key moderators that underlie the emotion regulation transfer effects of activity attachments. For example, individuals high in anxious interpersonal attachment use maladaptive emotion regulation strategies (i.e., hyper-activating negative emotions) that maintain their overdependence on others to regulate their emotional distress (Mikulincer & Shaver, 2016). Our investigation suggests that activity attachments are an effective coping strategy for individuals with anxious interpersonal attachment beliefs. However, the picture is unclear on the specific emotion regulation strategies activities promote and whether they reduce the risk of turning to more maladaptive emotion regulation strategies that characterize anxious attachment. We believe that activity attachments improve intrapersonal emotion regulation strategies (i.e., attentional focus and reappraisal strategies, Gross, 2015) and can help individuals regulate emotions in their interpersonal and intrapersonal lives. One might hypothesize, for example, that the attentional focus and reappraisal strategies activity attachments promote will attenuate the positive relationship between insecure attachment and maladaptive emotion regulation strategies. We believe these benefits may be more pronounced for those high in anxious attachment.

The total exploratory support (RESS total) of participants' activity attachments also significantly reduced the negative relationship between insecure interpersonal attachment (marginal significance avoidant attachment *p* =.056) and wellbeing. In addition, self-efficacy support also significantly attenuated the negative relationship between avoidant attachment and wellbeing. These results indicate that some activity attachment behaviours/benefits may be more effective for attenuating the negative effects of different interpersonal insecurities (i.e., anxious or avoidant interpersonal beliefs). Our findings suggest that the self-efficacy benefits individuals glean from achieving desirable outcomes in their activity attachments only reduce the negative effects avoidant attachment beliefs inflict on individuals' wellbeing. In contrast to anxiously attached individuals, avoidantly attached individuals prefer to avoid social intimacy and support when pursuing personal goals (Mikulincer & Shaver, 2016). Thus, activity attachment may provide an important means of regulating individuals' self-efficacy while remaining emotionally isolated from others and, in this way, attenuate the wellbeing costs associated with their avoidant interpersonal behaviour. These findings provide a preliminary insight into how different activity attachment benefits attenuate the wellbeing costs associated with anxious and avoidant interpersonal beliefs.

Future research would do well to explore the attachment and exploratory behaviours that other nonhuman attachments support and their compensatory effects. Research has gone some way in explaining the characteristics that define nonhuman attachment relationships (i.e., the physical protection of animals, agency over objects, and the security of deities, Kwong & Bartholomew, 2011; Keefer & Rothschild, 2020; Granqvist & Hagekull, 1999). However, research exploring how these nonhuman relationships affect individuals' intrapersonal affective regulation and interpersonal interactions are limited. By applying the RASS, RESS, and relevant emotion regulation scales (see Preece et al., 2018), future research can identify the specific behaviours and benefits other activity attachments support and their impacts on individuals’ emotional functioning in their interpersonal and intrapersonal lives.

Beyond our focus on the potential benefits of engaging in sporting activity, researchers could use the RASS and RESS to explore people's habitual behaviour in antisocial activity. For example, researchers could use these scales to explore the emotion regulation processes and benefits that may underlie people's dependency on rather more destructive forms of activity (i.e., drug abuse, self-harm, antisocial and criminal behaviour). By understanding the mechanisms that drive self-destructive activity and more adaptive forms of activity and their similarities, practitioners can prescribe effective interventions that allow individuals to self-regulate. For example, Woodman and Welch (2020) recently explored the mechanisms that underlie the anxiolytic benefits of pain exposure during endurance running and the similar benefits reported by self-harmers. Thus, if endurance activities can fulfil an emotion regulation function, they may help reduce people's participation in self-destructive strategies, such as self-harm. Future research would do well to explore the emotion regulation mechanisms that underlie engagement in a vast range of activities via the application of the RASS and RESS.

**Limitations**

Although our findings provide initial support for the psychometric properties of the attachment and exploratory scales, we consider measure development to be a continuous process and urge researchers to confirm these findings. Furthermore, the application of these scales is not limited to sporting activity and human agents. Thus, the scope of these scales is vast and requires exploration.

The cross-sectional nature of Study 2 is a clear limitation. Therefore, further longitudinal research is necessary to substantiate the findings above. Specifically, we urge researchers to look into how individuals' interpersonal and activity attachment relationships interact over time and affect individuals' sense of security, emotional functioning, and overall health. A further consideration would be to recruit participants who score extremely high in insecure interpersonal attachment and attachment-related disorders (Hornor, 2019). This research would help promote activities as a practical attachment emotion regulation strategy for individuals suffering from insecure interpersonal relationships.

**Conclusion**

The findings in this paper provide valuable insight into the emotion regulation role of activity attachments and their compensatory effects. This study broadens the scope of attachment theory by offering a novel research avenue for exploring how activity attachment may be beneficial for emotion regulation and offers some directions for understanding the underlying mechanisms involved. Furthermore, the extension of attachment theory and emotion regulation literature into the field of activities invite questions regarding their therapeutic effects on other populations. Clinically, the transferable emotion regulation strategies activity attachments support might improve individuals’ ability to effectively regulate distressing emotions and reduce the use of more maladaptive strategies, such as substance abuse and self-harm. Thus, the emotion regulation effects of individuals’ activities clearly warrant further investigation, especially in clinical populations who struggle to regulate their emotions.

**Chapter 5 – General Discussion**

In the present chapter we aim to discuss the central thesis objectives before discussing the results obtained from the three research chapters (Chapters 2, 3, and 4) and their theoretical, applied, and methodological implications. Finally, we discuss directions for future research and the overall strengths and limitations of the thesis.

**Summary of results**

In Chapter 2 we aimed to investigate participants’ emotion regulation and agency difficulties in the time between participation. The findings from two retrospective studies (i.e., Study 1 & 2) and one longitudinal study (i.e., Study 3) supported our hypothesis. Specifically, only high-risk climbers, such as traditional climbers and mountaineers, experienced a significant increase in emotion regulation and agency difficulty as time increased from their last participation. Low-risk counterparts, such as sport climbers, and low-risk sports controls, such as runners and swimmers, did not experience an increase in agentic emotion regulation difficulty between participation. We conclude that the decay of high-risk climbers' agentic emotion regulation benefits over time acts as a primary motive to return to their activity and once again glean an agentic emotion regulation benefit.

Furthermore, neither high-risk nor low-risk sporting participants displayed an increase in sensation need satisfaction in the time between participation. These findings further support Woodman and colleagues (2010) agentic emotion regulation theory that suggests not all high-risk activities are motivated by sensation need satisfaction. In other words, the additional risk experienced by high-risk climbers serves a regulatory function for reducing agentic emotion regulation difficulties and not as a means of fulfilling sensation seeking needs. Collectively, these studies provide compelling evidence for the agentic emotion regulation function of high-risk climbing and individuals' motives for this regulatory benefit.

The results reported in Chapter 2 exemplified some individuals' reliance on their sport to attenuate their emotion regulation difficulties. Relationships of this nature are analogous to attachment relationships, in which individuals seek to develop and maintain relationships that help to manage emotions (Bowlby's (1969). Thus, in Chapter 3 we investigated the broad application of Bowlby's (1969, 1973, 1980) attachment theory in explaining individuals' interpersonal and activity relationships. The subsequent research focused on expanding the scope of attachment theory by investigating athletes' perceptions, beliefs, and behaviours towards their activities in service of their attachment emotion regulation needs.

In Study 4 we focused on investigating three main questions: what do athletes' activity attachments look like? To what extent do athletes' activity attachments support fundamental attachment and exploratory behaviours? How do athletes' activity attachments interact with their interpersonal attachments? The results from Study 4 provided preliminary qualitative evidence that athletes can form genuine attachment bonds with their sporting activities (Bowlby, 1980; Haven & Zeifman, 1994); using their activity as a safe haven from distress and a secure environment to explore and express their emotions. Athletes' accounts provided valuable insight into the emotion regulation processes of their activity attachments. Firstly, athletes emphasized the importance of their activity domain as a safe haven from which to reflect, express, and reappraise their interpersonal and intrapersonal anxieties. Secondly, participants discussed transferring their activity attachment emotion regulation strategies, such as self-reflection and reappraisal strategies, into their interpersonal and intrapersonal lives. Furthermore, athletes reported using their activity attachments as a compensatory emotion regulation strategy for the apprehension, insecurity, and lack of support they experienced in their close interpersonal relationships. Collectively, these results support the application of attachment theory in expanding our understanding of human-activity relationships and the compensatory roles these relationships serve for those suffering from social insecurity.

In Chapter 4 we aimed to test the compensatory hypothesis that activity attachments will attenuate the negative relationship between insecure interpersonal attachment and wellbeing (Study 6). To test our compensatory hypothesis, the initial challenge was to develop scales capable of measuring the attachment and exploratory support human-activity relationship support. Thus, Study 5 applied the themes that emerged in Chapter 3 to develop and validate two new scales: the 4-factor Relationship Attachment Support Scale (RASS) and 6-factor Relationship Exploratory Support Scale (RESS). Using these scales, the results from Study 6 supported the compensatory hypothesis. Specifically, activity attachments attenuated the negative relationship between insecure interpersonal attachment and wellbeing by bolstering participants' ability to regulate challenging emotions in their everyday lives (i.e., RASS personal reflection and emotion regulation transfer subscales). Thus, participants' emotion regulation transfer benefits from their activity attachments to everyday life proved significant in explaining this compensatory relationship. Overall, these results support the observations reported in Chapter 3 and emphasize the therapeutic implications of activity attachments for those suffering from social insecurity.

**Theoretical and methodological implications**

**Different sports satisfy different agentic emotion regulation motives**

The findings discussed in Chapter 2 suggest that not all sports are equal in the agentic emotion regulation opportunities that they provide or the motives that they satisfy. Our in-depth analysis across high-risk and low-risk climbing disciplines indicates that participants should not be considered homogeneous in their motivation to participate. Specifically, our results demonstrate that high-risk climbers, such as mountaineers and traditional climbers, experience greater difficulty regulating their emotions and sense of agency between participation than their low-risk counterparts (i.e., sport climbers) and low-risk sport controls (i.e., runners, footballers). This process speaks to the agentic emotion regulation function of high-risk climbing by satisfying participants' motives to exercise agency over their lives and to regulate externally derived identifiable emotions. In this way, participation helps to regulate the agentic emotion regulation difficulties that high-risk climbers experience in daily life. Collectively, these results help to explain participants' motives to repeatedly engage in high-risk climbing activities by investigating the relative decay of the agentic emotion regulation benefits high-risk climbers transfer back into their daily lives. Low-risk climbers and sports controls reported no significant increase in agency and emotion regulation difficulty in the time between participation. These findings suggest that the motives to engage in low-risk sports may lie within an alternative motivational framework (e.g., Self Determination Theory, Deci & Ryan, 1985). Future research would do well to explore the motives related sports satisfy in line with their agentic emotion regulation opportunities and reported benefits.

**Risk can be good for your health**

More than ten years of research have reported the benefits of engaging in high-risk sports under the agentic emotion regulation framework (Barlow et al., 2013; Woodman et al., 2010; Woodman et al., 2020). Previous research and the findings discussed in Chapter 2 collectively highlight the agentic emotion regulation function high-risk climbing serves and how long these benefits last (1 to 6 weeks, Barlow et al., 2013). The results provide further evidence that high-risk sports provide agentic emotional regulation benefits that are difficult to experience in low-risk sports and domestic life (Barlow et al., 2013). Despite this evidence, research has not even begun to leverage the implications that this could have for populations outside the high-risk sports community. For example, populations who report difficulty identifying, describing, and regulating their emotions and sense of agency may benefit from engaging in more adaptive forms of risk-taking, such as high-risk sports. Specifically, antisocial risk-takers and alexithymic individuals may benefit from experiencing an external and easily identifiable source of anxiety, managing this anxiety, and thus feel a greater sense of emotional control. It is worth noting that high-risk sporting participants, alexithymic individuals, and antisocial risk-takers (Brindle, 2016) report engaging in risk-taking activities to attenuate their agentic emotion regulation difficulties (Barlow et al., 2013; Klonsky, 2007, 2009; Woodman & Welch, 2022). One could argue that participating in high-risk sports is a less destructive agentic emotion regulation strategy than engaging in self-destructive risk-taking activities such as self-harm or drug abuse. Therefore, we encourage researchers to investigate the underlying emotion regulation processes and effects of high-risk sports and antisocial risk-taking. This research would help identify whether certain high-risk sports and antisocial risk-taking activities share similar agentic emotion regulation processes and effects. In that case, the high-risk sport may serve as an attractive alternative for attenuating one's agentic emotion regulation difficulties. Indeed, experimental research is needed to investigate whether alexithymic and antisocial risk-taking populations would receive any such benefit.

**Attachment theory and its application in human-activity relationships**

The most important theoretical implications of the current thesis concern the application of attachment theory to human-sport activity relationships and the compensatory attachment function that these relationships can serve. Bowlby's (1969, p. 13) attachment theory assumes that individuals can develop attachments with "a person (or a place or thing)" in pursuit of a safe haven from distress and a secure base from which to explore and develop. In line with attachment theorists, our investigation goes some way to explain the emotion regulation and wellbeing benefits of activity attachment in the absence of secure interpersonal relationships (Haven & Zeifman, 1994; Keefer et al., 2014; Kwong & Bartholomew, 2011).

**Attachment relationships are not solely interpersonal**

Attachment research has been primarily concerned with interpersonal relationships, reserving the provision of attachment needs for human agents (Sutton, 2019). Comparatively, research has devoted little attention to understanding the attachment function that nonhuman agents serve (Keefer et al., 2014). Thus, the present thesis has focused on exploring the importance of activity in fulfilling individuals' fundamental attachment and exploratory needs (Grossmann & Grossmann, 2020; Haven & Zeifman, 1994). The results discussed in Chapter 3 go some way toward explaining the emotion regulation processes underlying individuals' attachment to activity. Specifically, athletes discussed their activity domain as a safe haven from which to reflect, identify, reappraise and express their intrapersonal and interpersonal anxieties. Furthermore, athletes discussed transferring these emotion regulation strategies, such as self-reflection and reappraisal, into their lives outside the activity context. The emotion regulation function athletes' activity attachments served helped some athletes manage their insecurities and anxiety towards close others. These results suggest that athletes develop genuine attachments with their activities as a means of regulating their personal and social anxieties. With the anxiolytic effects of activity attachment in mind, we encourage researchers to investigate other nonhuman agents' ability to provide attachment support, especially in lieu of secure social relationships.

Collectively, these findings suggest that attachment theory offers a fruitful framework for understanding the full scope of human-activity relationships and the therapeutic behaviours they support. Thus, this thesis expands upon traditional interpersonal attachment representations by exploring the emotion regulation processes activity attachments support.

**Attachment scale development and methodological implications**

In order to investigate the attachment and exploratory support of interpersonal and activity attachment relationships at scale, we first needed to develop appropriate measures. To that end, Study 5 developed the 4-factor Relationship Attachment Support Scale (RASS) and 6-factor Relationship Exploration Support Scale (RESS). These measures go beyond traditional scales measuring anxious and avoidant beliefs (Fraley, Heffernan, Vicary, & Brumbaugh, 2011) by measuring the specific behaviours that genuine attachment relationships support (Grossmann & Grossmann, 2020; Haven & Zeifman, 1994). Furthermore, we designed the items for these scales to accommodate any agent specified by the researcher (i.e., If I have concerns or worries, I usually seek out [*insert agent here*] for comfort). In other words, researchers can measure the attachment and exploratory support provided by any relationship that they specify (i.e., a specific person, sporting activity, pet, object). The RASS and RESS are the first agent-flexible scales that provide a comprehensive measurement of attachment and exploratory support. These advancements in scale development would be beneficial for measuring the health implications of specific relationships and any subsequent attachment-based intervention. As it stands, the application of these scales extends far beyond interpersonal relationships or sporting activities. Thus, we encourage future research to apply and validate these scales across various agents.

The meticulous process that we adopted to inform our understanding of activity attachment and to develop measures of attachment and exploratory functioning are notable methodological advancements from this thesis. Firstly, we applied a qualitative approach to investigate the relevance of Bowlby's attachment theory in explaining athletes' activity experiences and behaviours (Chapter 3). Secondly, we used the behavioural themes from our qualitative analysis to inform the initial factor structure and corresponding items of our scales (Chapter 4). Thirdly, all aspects of the scales, such as the introduction, items, factor structure, and scale, were externally assessed by two rounds of independent attachment experts. Lastly, we selected the best-performing items and applied a Bayesian Confirmatory Factor Analysis approach to analyse the scales' psychometric properties. Finally, the new scales underwent an extensive statistical procedure to assess their convergence, model fit, and sensitivity by applying Depaoli and Van de Schoot's (2017) WAMBS checklist (When to worry and how to Avoid the Misuse of Bayesian Statistics). Each of the aforementioned steps was conducted successfully and resulted in the scales reporting excellent model fit and psychometric properties.

By utilizing the strength of both qualitative and quantitative methodologies, we avoided the mistake of assuming symmetry across individuals' interpersonal and activity attachment behaviours (Fetters, Curry & Creswell 2013). That is, we investigated the attachment and exploratory function of participants' activity and social relationships rather than focusing on the insecurities that characterize interpersonal relationships (i.e., avoidant and anxious attachment styles, Fraley et al., 2011). This approach proved invaluable for identifying the emotion regulation processes underlying participants’ activity attachments and the efficacy of Bowlby's (1980) attachment theory in an activity attachment context.

**Compensatory Hypothesis**

According to the compensatory hypothesis, individuals will pursue alternative attachment relationships to compensate for the lack of support they receive from their insecure interpersonal attachments (Bowlby, 1969; Keefer et al., 2014). The findings presented in Chapter 3 provided preliminary insight into the emotion regulation processes that underlie activity attachments and their interpersonal anxiolytic effects.

The accounts reported in Chapter 3 suggest that athletes formed distinctly different emotion regulation strategies and expectations concerning stability, availability, and regulatory success of their activity and close social relationships. The secure attachment strategies athletes often displayed in their activity, such as freely experiencing and regulating strong emotions, were rooted in their experiences of their activity as a passive, controllable, and secure agent (Mikulincer & Shaver, 2016). Notably, some athletes reported experiencing an emotion regulation transfer benefit from their activity domain to their everyday lives. Specifically, athletes felt that their activity attachment experiences helped them reflect and reappraise challenging emotions in their everyday lives. Conversely, some athletes' insecure interpersonal experiences exacerbated their deactivation strategies when managing their emotions around others. Specifically, some athletes reported suppressing their emotions around others to reduce emotional intimacy (Mikulincer & Florian, 1995). As Keefer and Rothchild (2020) suggest, these behavioural differences may reflect humans' greater ability to act insecurely compared to non-living agents. Given that individuals likely feel more agentic in their nonhuman attachment relationships, they will likely gain security from these agents when they doubt the security of others. Indeed, athletes' divergent emotion regulation strategies across their activity and interpersonal attachments speak to a compensatory relationship. That is, the development of secure activity attachment behaviours and insecure interpersonal attachment behaviours.

The results discussed in Chapter 4 provided quantitative support for the compensatory hypothesis. Specifically, activity attachments attenuate the negative relationship between insecure interpersonal relationships and wellbeing by bolstering participants' ability to regulate challenging emotions in everyday life. These results suggest that the activity environment may provide unique opportunities for exercising, improving, and transferring adaptive emotion regulation strategies. Importantly, activity attachments helped individuals with high anxious and avoidant interpersonal beliefs regulate their challenging emotions and wellbeing. These results are consistent with previous literature suggesting that individuals will seek emotional support from nonhuman agents, such as pets and objects, when they experience instability in their social relationships (Carr & Rockett, 2017; Keefer & Rothschild, 2020). With the exception of this thesis, the specific emotion regulation processes human-nonhuman attachments support remains largely unexplored. Thus, it is worthy of future research to take a more in-depth look at the emotion regulation processes specific nonhuman agents support.

The results discussed in Chapters 3 and 4 are consistent with the notion that individuals can establish multiple attachment bonds with human and nonhuman agents to regulate their attachment needs (i.e., develop attachment networks, Fraley et al., 2011; Hazan & Zeifman, 1994). However, individuals do not experience or consider all attachment bonds equally. That is, certain attachment behaviours occur more frequently across different attachment bonds due to the support they provide (i.e., mother and father figures, Dakof & Taylor, 1990; Grossmann & Grossmann, 2020). Our results indicated that individuals high in avoidant and anxious interpersonal attachment gleaned more emotion regulation support, such as freely reflecting, expressing, and reappraising emotions, in their activity domains. Alternatively, some athletes commented on how others could comfort them by providing verbal support. These accounts support prior research suggesting that individuals develop different attachment bonds to fulfil various attachment needs (Dakof & Taylor, 1990). The benefit of having multiple attachment relationships is that support will most likely be available when needed. Thus, incorporating activities into one's attachment *network* may prove to be an adaptive response for increasing individuals' resilience to social insecurity.

Although our findings are convincing, we do not suggest that athletes' activity attachments completely compensate for interpersonal support. We do not dispute the notion that secure interpersonal attachments make the ideal relationship from which to glean attachment support (Bowlby, 1980). Ainsworth and Bell's (1974) sensitivity theory outlines the interpersonal behaviours that best serve one's attachment and exploratory needs, exemplifying the importance of interpersonal relationships. Rather, we suggest that activity attachments can serve as an adaptive response for managing interpersonal insecurity by facilitating the regulation of emotion.

**Agentic emotion regulation theory and attachment theory: similarities and differences**

Agentic emotion regulation theory and attachment theory highlight the emotion regulation processes sporting activities support (Barlow et al., 2013; Bowlby, 1980). The greater agentic emotion regulation experiences high-risk sports exercise drove the agentic emotion regulation benefits participants experienced. Thus, high-risk sports participants' ability to agentically regulate externally derived emotions in their sports domain, such as fear in response to a dangerous environment, temporarily improved their ability to regulate strong emotions in daily life (Barlow et al., 2013). In contrast, the security of participants' activity attachments drove the emotion regulation benefits observed under the attachment theory framework. Specifically, the activity domain provided a safe environment to reflect, identify, reappraise, and express one's challenging emotions and anxieties. Furthermore, these emotion regulation strategies significantly reduced the wellbeing costs associated with insecure interpersonal relationships. Albeit via different processes, these theoretical frameworks go some way to explaining the emotion regulation processes and benefits participants transfer from their sporting activities to daily life domain.

However, research is yet to explore whether the emotion regulation processes discussed above are equally operational in certain activities. The current thesis has investigated attachment and agentic emotion regulation theory in isolation, and therefore, their interactive effects remain unexplored. Thus, it is unclear whether participants derive their emotion regulation benefits predominantly from their activity attachments, agentic emotion regulation experiences, or both. Studies 1, 2, and 3 revealed that agentic emotion regulation benefits traditional climbers transferred from their climbing domains to their everyday lives were contingent on the risk imposed by their sport. In other words, the physical danger that is omnipresent in high-risk climbing environments afforded participants a greater opportunity to regulate their emotions and sense of agency temporarily. Conversely, Studies 4 and 6 suggest that sporting participants experienced an attachment emotion regulation benefit regardless of the risk imposed by their activity. These results suggest that the emotion regulation processes underlying the attachment framework may be more accessible and operational across activities in general. Therefore, sporting activities do not need to be high-risk to derive an attachment-based emotion regulation benefit.

Theoretically, high-risk sports participants may derive an attachment and agentic emotion regulation benefit from their activity. However, future research is needed to investigate whether an attachment-by-agentic emotion regulation interaction would derive any additional benefits. Investigating the attachment-by-agentic emotion regulation anxiolytic benefits in population suffering from high levels of alexithymia, emotion dysregulation, and interpersonal insecurity would be an interesting direction for future research. Therefore, we encourage future research to investigate these lines of inquiry and incorporate other affective frameworks to improve our understanding of the emotion regulation function activities serve (e.g., the process model of emotion regulation, Gross, 2015).

**Applied implications**

The findings presented in this thesis have far-reaching implications regarding the regulation of emotion and fulfilment of individuals' basic psychological needs. Whether the activity-emotion regulation benefits lie within an agentic emotion regulation or attachment framework, activities possess unique affordances that help attenuate participants' emotional difficulties. Of particular importance are the processes by which activity assists individuals in regulating strong emotions. Specifically, engaging in high-risk climbing was shown to temporarily reduce participants' agentic emotion regulation difficulties by providing an opportunity to regulate strong identifiable emotions and exercise control over oneself. In the attachment framework, activity helped exercise participants' self-reflection and reappraisal strategies in response to interpersonal and intrapersonal anxieties. We will now discuss the applied implications of both these frameworks.

The results discussed in Chapter 2 suggests that engaging in high-risk sports may benefit individuals who struggle to regulate their emotions and sense of agency in domestic life. Indeed, our findings could have significant implications for individuals who regulate such difficulties via antisocial activities (Eisenberg et al., 2001; Klonsky, 2007, 2009). Depriving individuals of the opportunity to assert agency over their environment and self-regulate has long been recognized as aversive to wellbeing (Bandura, 2006; Gross, 2002). Therefore, if individuals' daily lives do not afford opportunities to satisfy their relative agentic emotion regulation needs, they may regulate these needs by engaging in antisocial activities (see Klonsky, 2007). A growing body of research suggests that maladaptive risky behaviours, such as drug abuse, self-harm, suicidal ideations, domestic violence, and criminal acts, are driven by deficits in emotion regulation and agency (Gillespie, Garofalo, & Velotti, 2018; Roberton et al., 2014). It is noteworthy that high-risk sporting participants and antisocial risk-takers experience risky behaviours as an effective strategy for attenuating their agentic emotion regulation difficulties. We argue that physical danger and external and easily identifiable emotions are omnipresent in the high-risk sports domain. Therefore, participants feel compelled to regulate their emotions and behaviour to avoid excessive bodily harm or death. These strong agentic emotion regulation experiences may reduce individuals' motivation to seek these experiences via antisocial activities where they incur social and financial costs. One might hypothesize, for example, that the agentic emotion regulation benefits from participating in high-risk sports will be more pronounced for those who engage in maladaptive risky behaviour to attenuate their agentic emotion regulation difficulty. In this way, high-risk sports could act as a preventative and reforming strategy for reducing antisocial risk takers' agentic emotion regulation difficulties and propensity to engage in risky self-destructive behaviour.

The results discussed in Chapters 3 and 4 suggest that when individuals hold anxious or avoidant beliefs toward close others, it is beneficial for their wellbeing to use activity as an emotion regulation strategy. Athletes' activity attachments appeared to slip beneath the insecurities characterizing relationships with others by providing an unconditional safe haven and secure base. Interestingly, since athletes do not typically experience feelings of mistrust or apprehension towards activity, their activity attachments are ideal for buffering against the insecurities they experience around others. In particular, activity attachments do not require participants to share emotions verbally; rather, they exercise intrapersonal emotion regulation strategies to manage their anxieties. These results have important implications for individuals who struggle to reflect, express, and manage their emotions around other people. For example, professionals working with vulnerable adults and children may boost their ability to attenuate distressing emotions and feel a sense of security by supporting their engagement in activity. Thus, individuals may engage in activities with the aim (implicit or explicit) of identifying, regulating, and expressing their emotions freely. In that case, there is likely an additional transferable benefit from participation. That is, participants may exercise their activity-based emotion regulation strategies to manage their interpersonal anxieties. Research has reported similar benefits when children in foster care interact with resident dogs to help manage their social apprehension (Kwong & Bartholomew, 2011; Rockett & Carr, 2014). Investigating the anxiolytic effects of activity attachment in vulnerable populations who suffer from prolonged or chronic social insecurity is an interesting avenue for future research. Equally, furthering our understanding of the underlying processes that support any anxiolytic benefits would also be worthwhile.

It is noteworthy that athletes who displayed avoidant attachment behaviour towards close others reported more instances of overexertion and injury when regulating distressing emotions in their activity (see Chapter 3). This self-reliant approach to need fulfilment is characteristic of avoidant attachment styles (Mikulincer& Shaver, 2016). Researchers have shown that people who rely on a single domain or relationship to meet their basic needs will suffer disproportionately when these needs are unmet (Mikulincer & Shaver, 2008; Milyavskaya et al., 2009; Moriarty, 2002). Furthermore, adopting a singular approach to need fulfilment has been shown to promote unhealthy rigid behaviours as a compensatory response (i.e., hoarding behaviours; Keefer & Rothchild, 2020). In support of these findings, the athletes who heavily relied on their activity attachments suffered physically and psychologically when their activity attachment behaviours could not attenuate the acute stressors they faced. Future research would do well to explore other risk factors (i.e., early trauma and chronic stress) that may promote unhealthy activity attachment relationships. One could argue that interventions which promote supportive interactions in social relationships and healthy activity attachment behaviours would be beneficial for promoting a multi-relational approach toward need satisfaction(Sheldon & Niemiec, 2006). Indeed, true experimental research is needed to test the feasibility of co-developing secure interpersonal and activity attachments and any interpersonal and intrapersonal emotional regulation benefits.

**Directions for future research**

**Therapeutic implications for future research**

Whether sporting activities improve individuals' ability to self-soothe difficult emotions by instilling a sense of security or increasing one's sense of emotional agency, it is clear that sporting activities hold significant implications for emotion regulation. Attachment and emotion regulation are important constructs for future research because their impact on abnormal emotional functioning is associated with many psychopathologies in the Diagnostic Statistical Manual criteria (Roehr, 2013). From a therapeutic perspective, sporting activities may provide an opportune environment to target and reform insecure attachments, unhealthy emotional functioning, and need thwarting.

Research suggests that the high-risk sporting environments provide external and easily identifiable sources of anxiety and regulating this anxiety bolsters participants' sense of emotional control (see Barlow et al., 2013; Woodman et al., 2020). Furthermore, our findings discussed in Chapter 2 suggest that this agentic emotion regulation benefit helps participants feel a greater sense of emotional agency in everyday life. Despite the emotion regulation affordances high-risk sports offer, no research has investigated the effects high-risk sports have on exercising, developing, and utilizing effective emotion regulation strategies within and outside the sporting context. However, if practitioners are to incorporate sporting activities of a higher risk nature in emotion regulation therapies (Mennin, Ellard, Fresco & Gross, 2013), understanding the regulatory processes these activities exercise and improve requires further investigation.

Gross's (2015) process model of emotion regulation provides a fertile framework for investigating the specific emotion regulation strategies high-risk sports exercise. For example, involvement in high-risk sports often requires participants to maintain their attention where it is most helpful (*attention selection*), choose appropriate challenges (*situation selection*), adapt to changes in the environment (*situation modification*), alter their initial appraisal of a situation (*reappraisal*), and suppress unhelpful thoughts (*suppression*) to attenuate their anxieties and perform effectively. We suggest that these emotion regulation strategies are salient in the high-risk sports domain and likely transfer to other important areas in participants' lives where they struggle to self-regulate. By investigating how emotions unfold over time and the strategies used to alter emotions, we can understand the effects these strategies have on individuals' wellbeing and regulatory success across different contexts. This research would expand our current findings and go some way to explain the emotion regulation processes that support the agentic emotion regulation transfer benefits observed in Studies 1, 2, and 3. Research in this area could see the prescription of higher risk sporting activities within a clinical setting as a strategy to reform unhealthy emotional functioning (e.g., alexithymia, emotional dysregulation, and antisocial personality and anxiety disorders, Roehr, 2013; Woodman & Welch, 2021).

This area poses a considerable challenge for future research; however, the core principle that defines emotion regulation therapies today (Renna et al., 2018) displays an affinity towards the regulatory properties high-risk sporting activities possess, as highlighted within this thesis. Specifically, emotion regulation therapies focus on the importance of agency, delineation of emotional functioning, emotional awareness, acceptance, increased motivational awareness, development of regulatory capabilities, and engagement in new contextual learning experiences (Mennin et al., 2013).

 The finding discussed in Chapter 2 suggests that the temporary agentic emotion regulation benefits experienced by high-risk climbers after participation are short-lived (i.e., 1 to 6 weeks). Understanding the factors that improve the transfer of these positive effects and reduce their deuteriation would be worthy of future research. Experimental research that manipulated the risk, the intensity of agentic emotion regulation experiences, and the duration of these experiences could provide insight into the factors that moderate the magnitude of these benefits. Equally, measuring participants' domestic life activities and subsequent agentic emotion regulation experiences could expose factors that decrease emotional self-efficacy. Employing a longitudinal repeated measures design using the before, during, and after SEAS could provide more insight into this area (Barlow et al., 2013).

Research suggests that our beliefs concerning whether emotions are controllable or uncontrollable and monitoring regulation success are crucial factors that shape our regulation efforts (Ford & Gross, 2018). We suggest that activity participants may experience additional benefits by discussing regulation success in their activity environment and how to apply these strategies in other important areas. Such practices may moderate participants' emotion regulation beliefs, regulation success and transfer of emotion regulation benefit from their activity to daily life environment. Furthermore, discussing regulatory efforts in this manner would likely improve emotional awareness and agency by transferring the process of emotion regulation from an implicit response to an explicit exercise (Ford & Gross, 2019; Gross, 2015). Therefore, emotional awareness and regulatory beliefs may moderate the emotion regulation transfer benefits observed under the attachment and agentic emotion regulation framework. Understanding the underlying mechanisms that may increase the emotion regulation benefits activities provide would be an interesting avenue for future research.

**Developing secure interpersonal and activity attachment bonds**

Globally, the prevalence of child and adolescent mental health problems such as chronic anxiety, depression, and aggression remains high (e.g., 10 to 20%) despite advancements in mental health research and delivery (Kieling et al., 2011). Among the risk factors that develop such emotion dysregulation difficulties (see Wlodarczyk et al., 2017), parent-child interactions are crucial because they impact children's social and intrapersonal coping strategies that mitigate or exacerbate mental health problems (Leijten et al., 2018). A large body of research has shown the effectiveness of therapy-play interventions that use physical play to improve parent-child interactions (i.e., attachment bonds, Money, Wilde & Dawson, 2021). Similarly, the activity domain may provide the ideal environment for a child to exercise their physical autonomy and test their caregiver's responsiveness by seeking attachment and exploratory support. For example, climbing activities that allow a child to explore and challenge themselves while testing their caregivers' support (e.g., physical or verbal support to prevent falling), may promote secure interpersonal attachments. Thus, an activity of this nature may also improve a caregiver's responsiveness in service to a child's needs for safety and comfort (see, Mesman & Emmen, 2013). Ideally, parent-child interventions of this nature would promote healthy emotion regulation strategies by exercising co-regulation with parents and intrapersonal regulation strategies associated with activity attachments. One could argue that a multi-dimensional (parents and activities) attachment approach to attenuating emotional challenges might be more effective than today's unidimensional parent/therapist interventions (Booth & Winstead, 2016; Money, Wilde, & Dawson, 2021; Munns, 2000).

**Unhealthy sports attachment relationships**

While most athletes' accounts in Chapter 3 portray their activity attachments as controllable and stable, Georgia highlighted the instability of her relationship with elite rugby. Specifically, she emphasized the pressures of participating in elite rugby and a tendency for others to treat her as disposable. Consequently, Georgia experienced feelings of anxiety and uncertainty regarding her participation in the sport. Notably, Georgia's account suggests that the security of athletes’ activity attachments may depend on the degree to which participants rely on other people and the security of these interpersonal activity relationships. It is worthy of future research to explore the interactive effects of athletes' activity social relationships on activity attachment behaviour. Research in this area would provide greater insight into the moderators of athletes’ activity attachment behaviour and their anxiolytic benefits.

**Elite performance and activity attachment**

Research suggests that traumatic and aversive social experiences that develop and characterize insecure attachment bonds (Bowlby 1969) are important elements in driving super-elite performance (i.e., Olympic medal performance Hardy et al., 2017; Sarkar, Fletcher & Brown, 2015). In particular, traumatic experiences, such as the loss of a family member, create intense negative emotions that damage individuals' sense of belonging and drive the need to succeed to regulate one's self-worth (Hardy et al., 2017; Rees et al., 2016). Athletes who experienced loss, separation, and frequent instability in close relationships increased their engagement in activity to cope with these events (see Chapter 3). One could argue that adverse interpersonal experiences motivate frequent participation in activities as a compensatory attachment response, contributing to the development of elite performance over time. Future research would do well to administer the RASS and RESS in talent development pathway programs to determine whether those who use activity as a compensatory attachment strategy display behaviour consistent with prior super-elite performers (see Hardy et al., 2017).

**Strengths and limitations of the thesis**

The main strength of this thesis lies in the application of multiple designs and data collection methods. The present thesis investigated our research questions from multiple angles by applying qualitative and quantitative methodologies, improving our understanding of the areas under investigation (Creswell & Plano, Clark, 2011). Our qualitative study included in-depth interviews with elite athletes to explore the nature of human-activity relationships and their relevance within an attachment theory framework. The quantitative methodologies included scale development and cross-sectional retrospective and longitudinal hypothesis testing using 'e-questionnaires'. Studies 1 to 3 were the first to investigate the process of agentic emotion regulation between participation. These studies demonstrated that high-risk climbers experience a significant increase in agentic emotion regulation difficulty between participation, motivating them to return to their sport to relinquish such difficulties. Studies 4 and 6 are the first to demonstrate that individuals glean attachment support from their activities in a manner congruent with Bowlby's (1969) attachment theory. The measures developed in this research have far-reaching implications for attachment theory regarding identifying and measuring the quality of attachment relationships. We used multiple software systems to collect and analyse qualitative (NVivo 12) and quantitative data (Qualtrics, Mplus, R, SPSS, and JASP) throughout this research. The methodologies applied within this thesis have been beneficial for extending my research experience by providing the opportunity to conduct face-to-face research, apply advanced Bayesian and Frequentist statistical approaches, and submit 3\* to 4\* research to high-impact journals. I believe the findings discussed in this thesis make a valuable contribution to the field of emotion regulation and attachment in an activity context. Of course, there are several limitations that require future research attention. For example, the cross-sectional nature of our data in Chapter 4 prohibits the ability to support causal relationships regarding the compensatory hypothesis. Furthermore, the small sample size in Study 3 clearly warrants replication. Future research applying longitudinal designs with larger sample sizes would help address questions around causality and generalizability. One limitation of using internet-based data collection methods was the potential for participants to report false information regarding their sporting participation (high-risk and low-risk activities), ability, and experience therein. Requiring relevant documentation, such as picture and video evidence, of participants' claims may provide one solution to this problem. Notably, the consistent support for the agentic emotion regulation hypothesis across three studies and in-depth interviews supporting the compensatory hypothesis mitigate this limitation. From a research training perspective, the main limitation of the present thesis is the absence of any true experimental designs.

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**Appendices**

**Appendix A: Chapter 2 Measurement Invariance**

**Analytical strategy**

We conducted a Bayesian structural equation model (BSEM) to further test the factor structure, model fit, and rigor of the Between Participation Sensation seeking, Emotion regulation and Agency Scale (SEAS). The limitations of applying a conventional confirmatory factor analysis (CFA) using maximum likelihood estimation to impose an independent cluster model (ICM) are well documented (see, Asparouhov & Muthén, 2010). BSEMs allows researchers to assess the factor validity of an identified model with fewer restrictions than ICM-CFA (Muthén & Asparouhov, 2012). Researchers can specify zero mean and small variance prior on cross-loadings and residual correlations within an identified model, resulting in more realistic parameter estimates (Lee & Song, 2004; see Muthén & Asparouhov, 2012, for a review). Thus, the following analysis aimed to substantiate the initial CFA SEAS validation study conducted by Barlow and colleagues (2013) by investigating the model fit of the SEAS under the Bayesian framework.

 The following BSEM models were estimated in Mplus version 8.5 for each of the SEAS. The models included non-informative priors for major loadings and informative approximate zero cross-loading and exact zero residuals. The prior variances for cross-loadings and residual correlations were specified at N (0, 0.01). Indicators and factors were standardized representing factor loadings and residual correlations with a 95% limit of -.20 and +.20 (i.e., small cross-loadings and residual variances; Muthén & Asparouhov, 2012). For each model we reported the posterior predictive p-value (*PPP*) and potential scale reduction factor (PSRF) range as an estimate of the model fit (Gelman & Rubin, 1992; Muthén & Asparouhov, 2012). Following Asparouhov and Muthén’s (2015) recommendations we assessed the stability of the model by varying the variance of the priors, as this can influence parameter estimates. Subsequently, we re-analyzed each model with prior variances of .005 and .015 for cross-loadings and parameter estimates, comparing these estimated with those from a prior variance of .01. The follow BSEMs included all the participants who were recruited in their respective study (study 1, 2 and 3) regardless of their sporting activity. This allowed us to test the factor structure of the SEASs across a variety of sporting participants (such as those who engage in low-risk sport, high-risk sport, or both). Thus, the sample sizes in the following analysis (e.g., all participants regardless of sporting pursuits) do not match the sample sizes reported in the manuscript (e.g., participant who met the eligibility criteria for Studies 1, 2 and 3).

**Mplus Between Participation Sensation seeking, Emotion regulation and Agency Scale Syntax**

 To provide some instruction comments are provided after the !s on the syntax. For a Summary of the Mplus Language go to <https://www.statmodel.com/language.html>.

TITLE: SEAS BSEM

DATA: FILE IS = ; ! Location of the data file with saved syntax.

VARIABLE: ! Label names in the data file, in this instance survey items.

NAMES ARE SST31 SST32 SST33 SST34 SST35 SST36

ERT31 ERT32 ERT33 ERT34 ERT35 ERT36

AT31 AT32 AT33 AT34 AT35 AT36;

USEVARIABLES ARE SST31-AT36; ! Specify variables you want to use.

DEFINE:

STANDARDIZE SST31-AT36; ! For standardized estimates.

ANALYSIS:

ESTIMATOR = BAYES; ! Specify BAYES to run Bayesian estimation.

FBITERATION = 200000; ! Specify number of MCMC iterations.

CHAINS = 2; ! Specify number of MCMC chains.

PROCESSORS=2;

THIN = 10; ! Use every 10th iteration to reduce autocorrelation.

POINT=MEDIAN; ! Statistic used as the point estimate for the posterior distribution.

ALGORITHM = GIBBS(PX1); ! Specify the type of algorithm to use.

BSEED = 3; ! Specify random seed to start the MCMC chains.

MODEL: ! Specify hypothesized item-factor structure.

SS BY SST31-SST36;

ER BY ERT31-ERT36;

A BY AT31-AT36;

SS @1;

ER @1;

A @1;

! Specify cross loadings, text in brackets are parameter labels

SS BY ERT31-AT36\*0 (SS7-SS18);

ER BY SST31-SST36\*0 (ER1-ER6);

ER BY AT31-AT36\*0 (ER7-ER12);

A BY SST31-ERT36\*0 (A1-A12);

SST31-AT36 (RV1-RV18);

SST31-AT36 WITH SST31-AT36 (CR1-CR153);

MODEL PRIORS:

! Specify prior means and variances, adjust to check prior sensitivity of the model.

SS7-SS18 ~ N(0,.01);

ER1-ER12 ~ N(0,.01);

A1-A12 ~ N(0,.01);

RV1-RV18 ~ IW(1,24); ! specify number of correlated residuals.

CR1-CR153 ~IW(0,24);

OUTPUT:

TECH1 TECH8 STDYX; ! Will display potential scale reduction factor and standardized estimates.

PLOT:

TYPE = PLOT2; ! Provides posterior trace, histogram, and autocorrelation plots.

**Results**

**Study 1 SEAS BSEM results**

We assessed each model using the same convergence and fit criteria (see, Muthén & Asparouhov, 2012, for recommendations). Each parameter trace plot displayed considerable overlap indicating that the parameters had converged on the posterior distribution. Additionally, autocorrelation was not considered large enough to warrant concern < 0.2 (Kruschke, 2013). We observed relatively smooth changes between adjacent frequency bars across all histograms suggesting that the posterior distributions were well represented (Depaoli & van de Schoot, 2017). With a sample of 663 participants each of the SEAS reported the following posterior predictive p-value (*PPP*) estimates with prior variances specified at N(0, 0.01): SEAS Time 1, *PPP* = 0.32; SEAS Time 2, *PPP* = 0.35; SEAS Time 3, *PPP* = 0.39. All *PPP* estimates above 0.05, and the potential scale reduction factor (PSRF) estimates between 1.0 and 1.1, indicated adequate Markov chain Monte Carlo (MCMC) chain convergence and a well-fitting model (Gelman & Rubin, 1992).

Significant standardized major loading suggested that items loaded well onto their intended factors (SS 0.53 – 0.91, ER 0.59 – 0.95, A 0.62 – 0.95), with trivial small cross-loading (< 0.2). Inter-factor correlations revealed weak relationships between agency and sensation seeking (<. 0.3) and emotion regulation and sensation seeking (< 0.3). Agency and emotion regulation revealed strong correlations across all three BSEM models (> 0.6). Altering our prior variances from .01 to .005 and .015 did not result in a meaningful change in the convergence, parameter estimates, and fit of the models, indicating low prior variance sensitivity and a robust fitting model (Muthén & Asparouhov, 2012).

**Study 2 SEAS BSEM results**

Each model was assessed using the same convergence and fit criteria from Study 1. With a sample of 291 participants none of the models raised any diagnostic concerns (PSRF 1.0 – 1.1) reporting the following *PPP* estimates: SEAS Time 1, *PPP* = 0.35; Time 2, *PPP* = 0.40; Time 3*, PPP* = 0.45. Significant standardized major loading suggested that items loaded well onto their intended factors (0.5 – 0.9) reporting trivial small cross-loading (< 0.2). Inter-factor correlations revealed weak relationships between agency and sensation seeking (<. 0.3) and emotion regulation and sensation seeking (< 0.34). Agency and emotion regulation revealed strong correlations across all three BSEM models (> 0.6). These results indicate that the models performed well under the three-factor hypothesized model of the SEAS.

**Study 3 SEAS BSEM results**

Each model was assessed using the same convergence and fit criteria applied in Study 1. With a sample of 161 participants none of the models raised any diagnostic concerns (PSRF 1.0 – 1.1) reporting the following *PPP* estimates: SEAS Time 1, *PPP* = 0.34; Time 2, *PPP* = 0.43; Time 3*, PPP* = 0.46. Significant standardized major loading suggested that items loaded well onto their intended factors (0.3 – 0.9) reporting trivial small cross-loading (< 0.2). Inter-factor correlations revealed weak relationships between agency and sensation seeking (<. 0.3) and emotion regulation and sensation seeking (< 0.3). Agency and emotion regulation revealed strong correlations across all three BSEM models (> 0.6). These results suggest that the models again performed well under the SEAS three-factor hypothesized model.

**Measurement discussion**

After nine separate BSEM assessments, the hypothesized three-factor model of the Sensation Seeking Emotion Regulation and Agency scale (SEAS) fitted well across retrospective and prospective research designs. These results provide further support for the reliability and validity of the SEAS as a measure of individuals sensation seeking, emotion regulation and agency motives.

**Appendix B: Chapter 3 Qualitative Interview Guide**

**Interview preparation letter**

Investigating the unique relationship elite athletes develop with their activity

Research topic: The interview aims to investigate your thoughts, feelings and beliefs towards your activity and activity environment that have developed through your unique experiences and expertise in your activity. We aim to talk about different experiential aspects of your activity such as your experience before, during and after activity participation and time in-between participation. We will discuss how these experiences and feelings towards your activity contrast with other aspects of your life outside of activity, such as your social and/or romantic relationships and domestic life environments. Furthermore, we will discuss the relative importance of your activity in comparison to other areas of your life (i.e., social and/or romantic relationships, domestic life environment). Throughout we will touch on the emotional bond you may have develop with your activity, aspects of your activity you may rely on and how your activity influences how you see and identify yourself.

Prior to the interview, please have a think about the areas we will be covering in the interview mentioned above and how they relate to you and your current and past experiences.

Thank you for volunteering to take part in this research, we sincerely appreciate your participation.

Cheers,

Marley C Willegers

**Semi Structured Interview Guide**

* Firstly, I’d like to thank you for agreeing to be interviewed
* During this interview I’d like to discuss the relationship you have towards (enter activity here) and the role (enter activity here) plays in your life.
* I’m particularly interested in the nature of your relationship with (enter activity here), and why it motivates you to return over and over again. I am also interested in your relationship with the (enter activity here) environment itself and its role in your life.

I’d like you ask you specifically your perspective on some previous research findings.

* Other areas that we potentially have not considered but may be important in influencing the nature of your relationship with ((enter activity here)), and why you participate in ((enter activity here)).
* I may present you with some quotes from other activity literature, to get your opinion, insight and perspective in relation to them.
* Throughout the interview I’ll be asking you about your experiences in and perceptions on the ((enter activity here)) domain, how these experiences have influenced the relationship you have towards your activity and the activity environment and contrasting them with your experiences and relationships within your everyday life, the daily life environment and in particular interpersonal relationships.

You have been asked to participate in this research due to your knowledge, expertise and dedication in (enter activity here).

If for any reason there is anything you do not want to answer that’s completely fine, you may ask to move on from that question. You are also free to ask for a break at any time and are free to withdraw at any time.

* All answers will be strictly confidential and only heard by myself and my supervisors Dr Ross Roberts and Prof Tim Woodman. Any part of this interview that we would like to report in a scientific paper or thesis will firstly be authorised by you. Only quotes with your permission to print will be reported and done so anonymously.
* To ensure accuracy I would like to record the interview if that is OK with you?
* If there is any point you do not understand my questions or I don’t make myself clear, please let me know rather than answering a question you think I may be trying to ask you.
* There are no right or wrong answers, we are interested in your perception of reality so please express yourself freely. We expect the interview to run anything between 1 to 2 hours, if the interview should run in excess of two hours will this be a problem for you?

Let’s start by you telling me about how you first got into (enter activity here)?

-Details about social relationships (family, friends), significant (enter activity here) relationships, younger years,

* What inspired to you start (enter activity here)?
* Please could you tell me about your ongoing activity experiences
* When was the last time you participated, competed, or performed at a high level?
* Do you participate in (enter activity here) with your partner? (Please could you tell me why that is)
* Are there any other activities you participate in or other disciplines of (enter activity here) you do?

(Participant’s activity - (enter activity here)).

*We have Just complete introduction stage and know I'd like to continue by asking you some questions regarding the nature of your relationship with (enter activity here) and the (enter activity here) environment. Firstly, I’m going to ask you a question follow this statement.*

*Some athletes have reported to form a strong emotional ties to their activity and activity environment due to the unique experiences it provides them.*

How does this contrast with your feelings and experiences in (enter activity here)?

Please could you describe for me how you feel when your (enter activity here)?

Could you please describe how you feel when you are in the (natural) (enter activity here) (environment)?

* Anxious, nervous, exited, comfortable, relaxed

How would you describe the relationship you have with (enter activity here)?

* Positive aspects of the relationship
* negative aspects (uncomfortable, pressure (self-derived or external pressure).
* Please could you give me an example of when you have felt like this?

What are your thoughts on predominantly having a positive relationship with (enter activity here)?

When you think about your feelings towards (enter activity here) what specific aspects of (enter activity here) do you think about?

* Prompt - (act of (enter activity here), (enter activity here) environment, emotions, social relationships)

What are your thoughts on having a strong bond with (enter activity here)?

What are your thoughts on those feelings transcending into how you feel about the natural (enter activity here) environment itself? (please could your give me an example).

Do you feel comfortable with the relationship you have with (enter activity here)

How do these emotional experiences (we have discussed) in (enter activity here) contrast with those you experience outside the (enter activity here) domain?

* Prompt (for example home environment, social and romantic relationships outside activity)

Please could you describe how they are different? – (for example, feelings towards activity environment – everyday environment, act of (enter activity here) - interpersonal relationships).

 - Please could you give me an example of this?

What are your thoughts on seeing your relationship with (enter activity here) as stable?

Please could you describe aspects of your activity you feel you rely on?

- ("I don’t " - could you go without (enter activity here)

* Prompts - (pushing limits psychologically – physically)
* emotions elicited, unique experience, control, simplicity, freedom, sensation, relief, environment).
* Please could you give me some examples?

Do you feel comfortable depending on (enter activity here) for these effects?

* Please can you tell me why do you think that is? (stability, always there)

What is your experience of feeling more comfortable depending on (enter activity here) (to satisfy your emotional needs) over close interpersonal other (romantic partners)?

* Prompt (that’s really interesting could you give me an example)

How are they different? (depend on each for different things)

What are your experiences of feel anxious or fearful that you won't be able to (enter activity here) anymore?

* Prompt (how often, intensity)

Have you ever felt that (enter activity here) and the (enter activity here) environment won't be there for you when you need it?

* (Prompt) if yes – please could you talk me through that experience?

How does the (in)stability of (enter activity here) in your life compare to other aspects of your life?

* Prompt: interpersonal relationships, family, friends, partners, work, and daily life.

*So, I’m going to ask you a question following this statement*

*When reflecting on one’s behaviour in the activity domain, participants often highlight their experience of feeling free and their ability to express themselves without the constraints of domestic life.*

How do your feelings and experiences contrast with this?

Do you feel comfortable expressing your true self in the (enter activity here) domain?

* (In the act of (enter activity here), social aspect)
* Prompt That interesting could you tell me why that is?

In what way do you feel you can (can’t) express yourself? (act and say what you want freely)

How do these experiences of self-expression in the (enter activity here) environment and when (enter activity here) compare to those you experience in your life outside the (enter activity here) domain?

Please could you tell me how they are different?

* Prompt please could you give me an example?

Is there anywhere where you feel you are constrained and cannot express yourself?

* Prompt (Work, everyday urban environments, in intimate relationships, social relationships, activity).

What are your thoughts on being most comfortable expressing yourself when (enter activity here) over other activities and roles you play?

* Prompt (roles, work, friends, partner, father, mother)?

What are your thoughts on (enter activity here) and the (enter activity here) environment providing an opportunity to reflect on your personal feelings?

Do you reflect and disclose these feeling elsewhere? (partner/social others)

* (Prompt) Where do you feel more comfortable?
* Could you please tell me why you think that is?

Do you feel more comfortable in yourself when you are closer to your activity and activity environment? (i.e., in the (enter activity here) as opposed to the city)

* (please could you tell me why you think that is?)
* Prompt – emotional comfort, security, there when you need it.

Have other areas in your life taken a back seat so you can consistently participate in (enter activity here)?

* Can you please give me some examples? (Prompt) family, work, other aspirations, romantic relationships

What sacrifices have you made to make that possible? (for example, moved to a new house location, sacrificed relationships).

*Some activity participants have reported a greater difficulty dealing with the stresses imposed on them in domestic life and romantic relationships, over those they experience in their activity domain. Often engaging in their activity to relieve these stresses.*

*One athlete stated; “the more stressed I am the more I run”*

How does this compare to your feelings and experiences?

Where does the majority of your stress in life stem from?

* (Prompt) – activity, work, family, friends, partner, daily life obligations, urban environment (cities).

When you are stressed where do you go and what do you do to relieve that stress?

* (Activity over interpersonal others, vice versa, activity environment over urban environment etc.)

What are your thoughts on your activity and activity environment providing an effective means of relieving these stresses you experience?

What are your thoughts on (enter activity here) being your primary outlet to relieve these stresses and provide comfort?

* Prompt – please could you tell me why is it that you (enter activity here) to relieve these stresses over seeking support from close others (over participating in your activity) or vice versa? (Don’t need to explain yourself, simple, uncomfortable)

 Having experienced stress in daily life outside of (enter activity here), how do you feel after a (enter activity here) session?

***Summarise Look at topics****: so just to summarise what you have said so far (this section), you feel as if you have…*

*I’m going to ask you a question following this statement*

*Throughout the activity literature and media participants have previously reflected on their experiences and suggested that the emotional and physical experiences of their activity are so ‘unique’, ‘special’ and ‘transformational’ that they become dependent on them, returning ‘time and time again’.*

What are your thoughts on this?

Could any other activities replace (enter activity here) and satisfy what (enter activity here) and the (enter activity here) environment provides?

What are your thoughts on (enter activity here) being the most enjoyable and fulfilling aspect of your life?

Prompt – ‘no’ where do you’re most fulfilling and happy experiences come from in life?

When considering your psychological needs, what are your thoughts on (enter activity here**)** being the most important aspect of your life in satisfying those needs?

What are your thoughts on (enter activity here) being the most important aspect of your life?

* Prompt - (compare to other aspects family, work) (if not where does it lye)
* (why not if reported to be most enjoyable aspect of life)
* (has there ever been a time when (enter activity here) was the most important aspect of your life?).

*Athletes often report the positive effect their activity has on their mood, reporting feeling of being more relaxed, content, in control and emotionally in-tune with themselves.*

How do this contrast with your experiences?

In what way does (enter activity here) alter your mood? (feel more emotionally Intune, in control, relief)

To what extent do these mood-altering effects transfer back into your life outside (enter activity here)?

* Please could you give me some examples (more relaxed, get on with others better, why)?

What are your thoughts on relying on (enter activity here) for these mood-altering effects?

Could any other area in life affect your mood in the same way (enter activity here) can?

* Could you give me some examples?
* How are they different?

Have you experienced negative consequences as a result of pursuing these positive mood-altering effects through (enter activity here) (overtraining, participate while injury, attempted beyond ability).

How does the (natural) (enter activity here) environment influence your mood in comparison to your daily life environment?

* Prompt (positive and negative aspects)

**Summarise Look at Topics** : so just to summarise what you have said so far (this section), you feel as if you have….

*After a period of absence**participants have reported strong urges to return to their activity, reporting feeling of being "stressed", "unhappy", "itchy" and “frustrated”.*

How do your feelings and experiences contrast with this?

What do you consider a significant period of time away from (enter activity here)?

In what way would this effect you?

* (mood and behaviour in daily life, interpersonal relationships)

Would you be able to describe to me the nature and intensity of these urges you have experienced towards (enter activity here)?

* (psychological, physical)
* Please Could you give me an example of when you have previously felt like this?

How would you cope with those emotional experiences?

* Prompt - (engage in other activities, social support, exercise, distraction)

Do you feel this level of distress when any other aspect of your life is temporarily unavailable?

* Prompt friends, family, partner, work.

Have these urges to (enter activity here) ever prevented you from fulfilling other obligations?

* Prompt - (work, relationship, social or family commitments)
* Please could you give me an example of when this has happened to you?

Have you experience negative consequences as a result of acting on these urges?

* Prompt – (over training, miss relationship conflict or difficulty)

Do you feel you have control over these urges?

What are your thoughts on areas outside of (enter activity here) influencing these urges to (enter activity here)?

* (stress derived from life outside activity, family, friends, partner, work, lack of freedom)?

When you return to (enter activity here) after these experiences in what way does it affect how you participate?

* (Increased risks, go big, impulsive, caution, stay for long than intended)

Would a holiday be considered a holiday without (enter activity here)?

*Some athletes report that the emotions and enjoyment they experience in their activity is so intense they find it hard to enjoy other aspects of life, and subsequently loose interest in other activity that were previously enjoyable.*

*One athlete stated; “I’m not happier, doing this other thing, than I am when I’m doing activity, so I might as well do activity”*

How does this compare with your feelings and experiences?

* Prompt (lost interest in other activities, maintaining social relationships, urban environments)

What is your experience of being preoccupied with thoughts of (enter activity here)?

Please could you describe nature of these thoughts?

* Prompt (type, intensity, duration, act of (enter activity here), the (enter activity here) environment)?

How often does that happen and where?

How have these experiences affected you?

* (Distracted from current tasks, irritating, left work early or home to (enter activity here), social conflict)
* Neglected obligations to (enter activity here) (work, social meetings)

With regards to the experiences you have shared and the effects (enter activity here) has on you, do any other aspects of your life derive similar experiences?

* Preoccupation with thoughts of relationships

**Summarise Look at topics**: so just to summarise what you have said so far (this section), you feel as if you have….

Please could you tell me your experiences of conflicts between other aspects of your life and your desire to (enter activity here)?

* Prompts - (with work, family, friends, and daily obligations)
* Please could you give me some examples?

Please could you describe to me any negative consequences you experienced as a result of your involvement in(enter activity here)?

* Outside and inside the activity domain (lack of relationship/family time)
* (Social and relationship sacrifice, moving jobs, time away, injury, illness, economic).

What sacrifices have you made to continue (enter activity here)?

* (Prompt- biggest sacrifice, relationships)

Have you ever thought that the negative experiences derived from these sacrifices are a problem?

* “yes” Would you be able to give me an example?
* (please could you expand on that for me?)

What are your thoughts on any of these negative experiences inhibited your ability to function normally?

* (please could you give me some examples?) (work, maintain relationships, injuries)
* ("no"- have you ever continued to (enter activity here) whilst injured).

How long did these negative effects last for? (Longest and shorted bout)

Throughout these negative experiences did you continue to (enter activity here)?

Why do you think that is?

* One place feel secure/safe
* (effects on mood, regulate sense of control, experience strong emotions, experience sensation, relief from other negative effects in life)

***Summarise Look at topics****: so just to summarise what you have said so far (this section), you feel as if you have….*

----------------------------------------------------------------------------------------------------------------

*In life people take on many roles across different context, such as their role at work "nurse", at home "partner, father, mother, in the social sphere "best friend" and in their hobbies "musician, tennis player, athlete.*

What is your view on being a professional (enter activity here) occupying the central component of who you are as a person?

* Why do you think that might be?

*Quote: Athlete reported “I’m trying to picture myself without volleyball, and I don’t know who I would be, I don’t know what my identity would be”.*

What are your thoughts on this?

Could you explain why (enter activity here) is (is not) more self-defining than other aspects of your life – (social and romantic relationships, family roles, external work or hobbies).

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| **Appendix C: Chapter 4 Measurement Invariance****Measure Invariance of the Short Form Relationship Attachment Support Scale and Relationship Exploration Support Scale****Table 11**Relationship Attachment Support Scale-Activity Short-Form Standardized Factor loadings with 95% credibility intervals in brackets.  |
| Items | Separation Distress | Safe Haven | Proximity Maintenance  | Secure Base |
| I become concerned for my wellbeing when I can’t participate in my preferred sport/activity  | **.95 [.80,1]** | -.06 [-.21 .08] | -.04 [-.20 .10] | -.01 [-.17 .13] |
| When I’m away from my preferred sport/activity for a while I start to feel more anxious  | **.79 [.57,.99]** |  .00 [.16 .16] |  .06 [.11.22] |  .00 [.15 .15] |
| When I haven’t participated in my preferred sport/activity for a while I feel less able to deal with problems in life  | **.78 [.56,.99]** |  .07 [.10 .23] | -.00 [-.17 .15] |  .01 [.14 .17] |
| If I have concerns or worries, I usually seek out my preferred sport/activity for comfort  | -.06 [-.21 .07] | **.95 [.88,1]** | -.01 [-.16.13] | -.01 [-.16 .13] |
| When I feel upset, I can rely on my preferred sport/activity to help me feel better  | -.01 [-.18 .15] | **.79 [.56,1]** | -.01 [-.18 .15] |  .05 [.12 .21] |
| When I am unhappy in life I turn to my preferred sport/activity to help me feel better  |  .08 [.07 .23] | **.80 [.62,1]** |  .03 [.12 .19] | -.02 [-.18 .12] |
| Being close to my sport/activity domain is very important to me  |  -.07 [-.23 .07] |  -.03 [-.19 .12] | **.95 [.87,1]** |  -.00 [-.16.15] |
| I feel more comfortable in myself when I have access to my preferred sport/activity  | .09 [-.09 .27] | .08 [-.10 .26] | **.59 [.31,.89]** | .06 [-.11 .24] |
| Having close access to my preferred sport/activity is very important to me  | .03 [-.14 .20] |  -.00 [-.18 .16] | **.76 [.50,1]** |  -.00 [-.18 .15] |
| I find it comforting knowing that my preferred sport/activity will always be there for me  | -.02 [.18.14] | -.02 [.18 .12] | -.01 [.17 .14] | **.93 [.86,1]** |
| I can count on my preferred sport/activity to be there no matter what  | -.016 [.18 .15] | -.01 [.19.15] | -.06 [.24 .11] | **.74 [.45,.98]** |
| I feel a sense of comfort knowing that my preferred sport/activity will be there for me when I need it  |  .0 [.15.16] |  .01 [.16 .17] |  .06 [.11.23] | **.73 [.48,.95]** |
| Note: Loadings and 95% Cis on intended factors in bold text. |  |  |  |  |

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| **Table 12**Relationship Exploration Support Scale-Activity Short-Form Standardized Factor loadings with 95% credibility intervals in brackets.  |
| Item | Security in Exploration | Emotion Regulation | Personal Reflection | Development | Self-Expression | Self Esteem |
| My preferred sport/activity has helped me to become more adventurous in other areas of life | **.95 [.87,1]**  | -.04 [-.22 .12] | -.03 [-.20 .14] | -.03 [-.20 .13] | -.03 [-.20 .14] | -.07 [-.24 .09] |
| Knowing that I have my preferred sport/activity to fall back on helps me to take on other challenges in life  | **.55 [.17,.93]**  | .06 [-.12 .25] | .08 [-.08 .25] | -.01 [-.19 .16] | .08 [-.10 .27] | .03 [-.15 .22] |
| My involvement in my preferred sport/activity has helped me strive to achieve personal goals  | **.68 [.32,1** | -.00 [-.19 .18] | -.04 [-.21 .12] | .04 [-.13 .22] | -.03 [-.21 .15] | .06 [-.13 .25] |
| I feel better able to deal with difficult emotions in everyday life thanks to my experiences in my preferred sport/activity  | .00 [-.16 .17] | **.95 [.88,1]** | -.05 [-.21 .10] | -.02 [-.19 .14] | -.04 [-.21 .12] | -.03 [-.20 .12] |
| My experiences in my preferred sport/activity help me to persist when the going gets tough in life  | .01 [-.16 .18] | **.72 [.40,1]**  | .00 [-.18 .17] | .01 [-.15 .18] | .01 [-.16 .18] | .03 [-.14 .21] |
| My preferred sport/activity makes me feel as though I could overcome difficult emotions  | -.03 [-.20.14] | **.77 [.47,1]**  | .07 [-.12 .24] | -.00 [-.17 .16] | .02 [-.14 .19] | -.00 [-.18 .17] |
| My preferred sport/activity helps me to think about how I am feeling  | -.03 [-.19 .13] | -.01 [-.17 .13] | **.95 [.88,1]** | -.01 [-.17 .14] | -.07 [.23 .08] | -.00 [-.17 .15] |
| My preferred sport/activity helps me to explore my feelings  | -.02 [-.18 .13] | -.01 [-.19 .15] | **.87 [.68,1]**  | -.01 [-.16 .14] | .02 [-.13 .18] | -.02 [-.19 .13] |
| My preferred sport/activity makes me feel more able to explore my feelings | .05 [-.10 .22] | .01 [-.16 .19] | **.76 [.57,.98]**  | .01 [-.13 .17] | .02 [-.13 .18] | .00 [-.19 .17] |
| My life wouldn’t look much different without my preferred sport/activity  | -.07 [.24.09] | -.06 [-.23 .11] | -.04 [-.22 .12] | **.96 [.88,1]**  | -.04 [-.22 .12] | -.07 [-.24 .09] |
| My preferred sport/activity has helped me develop as a person  | .07 [-.11 .25] | .06 [-.11 .23] | .06 [-.09 .22] | **.56 [.28,.86]**  | .03 [-.13 .20] | .09 [-.10 .27] |
| My preferred sport/activity has helped me to shape who I am  | .05 [-.13 .23] | .02[ -.15 .20] | .00 [-.16 .17] | **.67 [.37,.96]**  | .04 [-.13 .22] | .04 [-.14 .23] |
| I feel comfortable exploring ways I can express myself when participating in my preferred sport/activity  | .01 [-.15 .18] | -.05 [-.22 .11] | -.06 [-.22 .10] | -.03 [-.20 .13] | **.95 [.88,1]**  | -.03 [-.20 .12] |
| I feel able to express myself when I am participating in my preferred sport/activity  | -.00 [-.18 .17] | .01 [-.16 .19] | .03 [-.13 .20] | .01 [-.15 .18] | **.72 [.42,1]**  | .01 [-.16 .19] |
| I feel I am free to be myself when I am participating in my preferred sport/activity  | -.02 [-.21.16] | .04 [-.14 .23] | .02 [-.15 .20] | .04 [-.13 .22] | **.61 [.25,.95]**  | .03 [-.16 .21] |
| My preferred sport/activity makes me feel more confident in myself  | -.04 [-.21 .12] | -.07 [-.25 .08] | -.03 [-.20 .13] | -.05 [-.22 .11] | -.01 [-.18 .15] | **.96 [.88,1]**  |
| The confidence I have gained from my preferred sport/activity helps me in other areas in life  | .04 [-.13 .21] | .06 [-.12 .24] | -.00 [-.16 .14] | .06 [-.10 .23] | -.02 [-.18 .13] | **.74 [.45,1]**  |
| My preferred sport/activity makes me feel more able to succeed in life  | .02 [-.15 .20] | .05 [-.14 .23] | .05 [-.10 .21] | .03 [-.15 .20] | .05 [-.12 .22] | **.65 [.31,.99]**  |
| Note: Loadings and 95% Cis on intended factors in bold text. |

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| **Table 13**Relationship Attachment Support Scale-Interpersonal Short-Form Standardized Factor loadings with 95% credibility intervals in brackets.  |
| Item | Separation Distress | Safe Haven | Proximity Maintenance  | Secure Base |
| I become concerned for my wellbeing when I can’t see this person  | **.95 [.87,1]** | -.03 [-.19 .12] | -.03 [-.19 .11] | -.01 [-.17 .14] |
| When I’m away from this person for a while I start to feel more anxious  | **.86 [.67,1]** | -.01 [-.17 .15] | .01 [-.16 .18] | -.03 [-.19 .12] |
| When I haven’t seen this person for a while, I feel less able to deal with problems in life  | **.80 [.57,1]** | .02[ -.15 .18] | -.00 [-.18 .17] | .00[ -.16 .16] |
| If I have concerns or worries, I usually seek out this person for comfort  | -.01 [-.17 .13] | **.96 [.88,1]** | -.02 [-.18 .12] | -.05 [-.20 .09] |
| When I feel upset, I can rely on this person to help me feel better  | -.05 [-.21 .11] | **.78 [.51,1]** | .03 [-.16 .21] | .04 [-.15 .23] |
| When I am unhappy in life I turn to this person to help me feel better  | .06 [-.09 .21] | **.78 [.56,1]** | .02[ -.15 .19] | .04 [-.14 .21] |
| Being close to this person is very important to me  | -.08 [-.23 .06] | .00 [-.15 .15] | **.96 [.89,1]** | -.02 [-.18 .12] |
| I feel more comfortable in myself when I have access to this person  | .10 [-.10 .28] | .02 [-.16 .21] | **.67 [.35,1]** | .05 [-.14 .24] |
| Having close access to this person is very important to me  | .05 [-.12 .21] | .00 [-.17 .17] | **.79 [.54,1]** | .01 [-.16 .18] |
| I find it comforting knowing that this person will always be there for me  | -.05 [-.21 .10] | -.00 [-.15.14] | -.05 [-.20 .10] | **.96 [.88,1]** |
| I can count on this person to be there no matter what  | .01 [-.15 .17] | -.03 [-.21 .15] | -.00 [-.19 .17] | **.77 [.48,1]** |
| I feel a sense of comfort knowing that this person will be there for me when I need them  | .04[ -.11 .19] | .04 [-.15 .23] | .08 [-.11 .26] | **.72 [.47,1]** |
| Note: Loadings and 95% Cis on intended factors in bold text. |

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| **Table 14**Relationship Exploration Support Scale-Interpersonal Short-Form Standardized Factor loadings with 95% credibility intervals in brackets.  |
| Item | Security in Exploration | Emotion Regulation | Personal Reflection | Development | Self-Expression | Self Esteem |
| This person has helped me to become more adventurous in other areas of life  | **.97 [.88,1]**  | -.08 [-.26,.09] | -.07 [-.24,.10] | -.06 [-.24,.11] | -.04 [-.22,.13] | -.07 [-.25,.09 |
| Knowing that I have this person to fall back on helps me to take on other challenges in life  | **.56 [.13,1]**  | .09 [-.12,.29] |  .03 [-.15,.21] | .03 [-.14,.22] | .06 [-.13,.25] | .05 [-.15,.25] |
| My involvement with this person has helped me strive to achieve personal goals  | .**64 [.28,1]**  | .03 [-.15,.23] | .06 [-.12,.23] | .04 [-.13,.22] | .00 [-.18,.18] | .05 [-.14,.25] |
| I feel better able to deal with difficult emotions in everyday life thanks to my experiences with this person  | .02 [-.15,.18]  | **.96 [.89,1]**  |  -.02 [-.19,.13] | -.02 [-.19,.13] | -.03 [-.20,.12] | -.03 [-.20,.13] |
| My experiences with this person help me to persist when the going gets tough in life  | -.01 [-.19,.17]  | **.74 [.37,1]**  |  -.03 [-.21,.15] | .04 [-.14,.22] | .01 [-.17,.19] | .01 [-.18,.20] |
| This person makes me feel as though I could overcome difficult emotions  | -.02 [-.20,.15]  | **.83 [.48,1]**  |  .04 [-.15,.22] | -.02 [-.19,.14] | .01 [-.17,.19] | .00 [-.19,.18] |
| This person helps me to think about how I am feeling  | -.02 [-.19,.14]  | -.01 [-.18,.14] |  **.97 [.89,1]**  | .00 [-.15,.16] | -.07 [-.23,.09] | -.02 [-.19,.13] |
| This person helps me to explore my feelings  | -.01 [ -.17,.14] | .01 [-.17,.19] |  **.87 [.63,1]**  | -.01 [-.17,.14] | .05 [-.12,.21] | -.03 [-.20,.14] |
| This person makes me feel more able to explore my feelings  |  .04 [-.13,.20] | .00 [-.18,.18] |  **.76 [.48,1]**  | .00 [-.16,.16] | .02 [-.15,.19] | .05 [-.12,.23] |
| My life wouldn’t look much different without this person  | -.07[-.25,.10] | -.07 [-.25,.09] |  -.07 [-.25,.09] | **.97 [.89,1]**  | -.06 [-.24,.11] | -.08 [-.26,.09] |
| This person has helped me develop as a person  | .07 [-.10,.25] | .06 [-.11,.25] |  .08 [-.09,.26] | **.51 [.21,.84]**  | .10 [-.07,.28] | .09 [-.09,.27] |
| This person has helped me to shape who I am  | .03 [-.15,.21] | .03 [-.16,.21] |  .02 [-.16,.21] | **.68 [.33,1]**  | .00 [-.18,.18] | .02 [-.16,.21] |
| I feel comfortable exploring ways I can express myself when I am with this person  | .00 [-.17,.17] | -.04 [-.22,.12] |  -.05 [-.22,.11] | -.07 [-.24,.10] | **.96 [.88,1]**  | -.03 [-.21,.13] |
| I feel able to express myself when I am with this person  | -.01 [-.19,.16] | .01 [-.17,.19] |  .04 [-.13,.21] | .05 [-.11,.21] | **.75 [.45,1]**  | .00 [-.18,.18] |
| I feel I am free to be myself when I am with this person  | -.00 [-.18,.18] | .02 [-.16,.21] |  -.00 [-.18,.17] | .03 [-.14,.20] | **.72 [.37,1]**  | .03 [-.17,.22] |
| This person makes me feel more confident in myself  | -.04 [-.20,.11] | -.03 [-.20,.12] |  .00 [-.16,.15] |  -.07 [-.23,.08] | .04 [-.11,.20] | **.97 [.90,1]**  |
| The confidence I have gained from this person helps me in other areas in life  | .03 [-.15,.20] | .02 [-.15,.20] |  .00 [-.17,.16] | .05 [-.11,.20] | -.00 [-.19,.16] | **.80 [.49,1]**  |
| This person makes me feel more able to succeed in life  | .05 [-.13,.22] | .0 [-.17,.19] |  -.00 [-.17,.16] | .05 [-.11 .20] | -.04 [-.21,.13] | **.80 [.49,1]**  |
| Note: Loadings and 95% Cis on intended factors in bold text. |

**Appendix D: Chapter 4 Bivariate Correlations**

**Bivariate Correlations of the Short Form Relationship Attachment Support Scale and Relationship Exploration Support Scale**

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| **Table 15**Means, SDs, McDonald’s omega (ω), Latent factor inter-correlations, and the 95% confidence intervals [in brackets] for the RASS Short-Form activity. |
|  | *M* | *SD* | ω | Separation distress  | Safe haven | Proximity maintenance | Secure base |
| Separation distress | 15.40 | 4.09 | .84 |  |  |  |  |
| Safe haven | 16.88 | 3.33 | .86 | .62[.44,.75]\* |  |  |  |
| Proximity maintenance | 18.25 | 2.41 | .78 | .63[.43,.76]\* | .61[.41,.75]\* |  |  |
| Secure base | 16.55 | 3.22 | .78 | .48[.26,.65]\* | .60[.41,.73]\* | .59[.38,.74]\* |  |

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| **Table 16**Means, SDs, McDonald’s omega (ω), Latent factor inter-correlations, and the 95% credibility intervals [in brackets] for the RESS Short-Form activity. |
|  | *M* | *SD* | ω | Security in exploration | Emotion regulation | Personal reflection | Development  | Self-expression | Self-efficacy |
| Security in exploration | 17.13 | 2.82 | .67 |  |  |  |  |  |  |
| Emotion regulation | 16.63 | 2.98 | .79 | .66[.44,.79]\* |  |  |  |  |  |
| Personal reflection | 15.22 | 3.67 | .86 | .49[.23,.68]\* | .70[.51,.82]\* |  |  |  |  |
| Development  | 17.83 | 2.64 | .69 | .58[.33,.74]\* | .56[.31,.73]\* | .35[.08,.57]\* |  |  |  |
| Self-expression  | 17.27 | 2.60 | .73 | .61[.39,.76]\* | .60[.39,.75]\* | .54[.32,.70]\* | .49[.22,.68]\* |  |  |
| Self-esteem | 17.58 | 2.53 | .81 | .70[.49,.82]\* | .71[.51,.83]\* | .49[.51.83]\* | .65[.41,.80]\* | .62[.40,.76]\* |  |

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| **Table 17**Means, SDs, McDonald’s omega (ω), Latent factor inter-correlations, and the 95% confidence intervals [in brackets] for the RASS Short-Form interpersonal. |
|  | *M* | *SD* | ω | Separation distress  | Safe haven | Proximity maintenance | Secure base |
| Separation distress | 14.33 | 4.01 | .86 |  |  |  |  |
| Safe haven | 17.51 | 2.78 | .86 | .56[.35,.71]\* |  |  |  |
| Proximity maintenance | 17.77 | 3.04 | .83 | .69[.52,.82]\* | .74[.65,.87]\* |  |  |
| Secure base | 18.12 | 2.76 | .81 | .51[.30,.68]\* | .78[,65,.87]\* | .75[,60,.86]\* |  |

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| **Table 18**Means, SDs, McDonald’s omega (ω), Latent factor inter-correlations, and the 95% credibility intervals [in brackets] for the RESS Short-Form interpersonal. |
|  | *M* | *SD* | ω | Security in exploration | Emotion regulation | Personal reflection | Development  | Self-expression | Self-efficacy |
| Security in exploration | 16.40 | 2.97 | .70 |  |  |  |  |  |  |
| Emotion regulation | 16.98 | 2.86 | .82 | .72[.47,.85]\* |  |  |  |  |  |
| Personal reflection | 16.15 | 3.22 | .87 | .63[.39,.78]\* | .77[.63,.86]\* |  |  |  |  |
| Development  | 17.65 | 2.79 | .68 | .56[.25,.76]\* | .66[.40,.80]\* | .58[.32,.76]\* |  |  |  |
| Self-expression  | 17.22 | 2.81 | .79 | .66[.43,.80]\* | .74[.56,.85]\* | .69[.51,.81]\* | .55[.27,.74]\* |  |  |
| Self-esteem | 16.91 | 3.02 | .88 | .76[.54,.88]\* | .80[.67,.88]\* | .72[.57,.83]\* | .65[.38,.81]\* | 76[.60,.86]\* |  |

**Appendix E: Chapter 4 Moderation Regression Results**

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| **Table 19**Models testing the hypothesized interaction between insecure attachment (anxiety/avoidance) and activity attachment (RESS support) on wellbeing.  |
|  |  *b* (*SE*) | *t* | *p* |
| Intercept | 53.96 (1.11) | 48.61 | <.001 |
|  Anxiety  | -1.50 (.28) | -5.20 | <.001 |
|  Activity emotion regulation support  | .75 (.38) | 1.95 | .051 |
|  Anxiety x Activity emotion regulation support | .18 (.09) | 1.93 | .053 |
|  R2 = .10 |   |  |  |
| Intercept | 53.74(1.11) | 48.28 | <.001 |
|  Anxiety  | -1.53(.29) | -5.25 | <.001 |
|  Activity personal reflection support | 0.41(.31) | 1.31 | .18 |
|  Anxiety x activity personal reflection support | 0.23(.07) | 3.09 | <.01 |
|  R2 = .11 |  |  |  |
| Intercept | 53.98(1.11) | 48.50 | <.001 |
|  Anxiety  | -1.48(.28) | -5.16 | <.001 |
|  Activity exploration total | 0.10(.08) | 1.29 | .19 |
|  Anxiety x activity exploration total | 0.04(.02) | 2.11 | .03 |
|  R2 = .09 |   |  |  |
| Intercept | 54.10(1.13) | 47.48 | <.001 |
|  Avoidance | -.48(.20) | -2.40 | .01 |
|  Activity emotion regulation support | .70(.39) | 1.77 | .07 |
|  Avoidance x activity emotion regulation support | .14(.06) | 2.23 | .01 |
|  R2 = .04 |   |  |  |
| Intercept | 54.32(1.14) | 47.43 | <.001 |
|  Avoidance | -.45(.20) | -2.22 | .02 |
|  Activity self-esteem support | .11(.44) | .26 | .79 |
|  Avoidance x activity self-esteem support | .18(.07) | 2.45 | .01 |
|  R2 = .03 |  |  |  |
| Intercept | 53.96(1.15) | 46.76 | <.001 |
|  Avoidance | -.52(.21) | -2.44 | .01 |
|  Activity personal reflection support | .31(.34) | .90 | .36 |
|  Avoidance x activity personal reflection support | .11(.06) | 1.81 | .07 |
|  R2 = .03 |  |  |  |
| Intercept | 54.13(1.13) | 47.51 | <.001 |
|  Avoidance | -.46(.20) | -2.25 | .02 |
|  Activity exploration total | .09(.08) | 1.15 | .24 |
|  Avoidance x activity exploration total | .02(01) | 1.84 | .06 |
|  R2 = .03 |  |  |  |

**Moderation Regression Results of the Short Form Relationship Attachment Support Scale and Relationship Exploration Support Scale**

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| **Table 20**Pairwise t-test comparing attachment and exploratory support (short form scales) across activity and interpersonal relationships.  |
|  | Activity Mean (*SE*) | Interpersonal Mean (*SE*) |  *t* |  *p* | Cohen’s *d* |
| Separation distress | 15.40 (.24) | 14.33 (.23) | 4.15 | <.001 | .24 |
| Proximity maintenance | 18.25 (.14) | 17.77 (.18) | 2.16 | .03 | .12 |
| Security in exploration | 17.14 (.16) | 16.40 (.17) | 3.63 | <.001 | .21 |
| Secure base | 16.55 (.19) | 18.12 (.16) | 6.79 | <.001 | .40 |
| Personal reflection | 15.22 (.21) | 16.15 (.19) | 3.85 | <.001 | .22 |
| Development | 17.83 (.15) | 17.65 (.16) | 1.03 | .30 | .06 |
|  |

1. Based upon Willegers, M., Woodman, T., & Tilley F. (2022). Agentic emotion regulation in high-risk sport: An in-depth analysis across climbing disciplines.Manuscript under review. [↑](#footnote-ref-1)
2. Using Mplus version 8.5, we conducted an additional Bayesian structural equation model (BSEM) to test the factor structure and model fit of the SEAS. We direct the interested reader to Appendix A. [↑](#footnote-ref-2)
3. Across all three studies in this paper, the interactions held when controlling for gender and years of sporting participation. Therefore, the authors conclude that the time × group interactions were driven by differences in groups agentic emotion regulation difficulty across time and not by differences in gender or year of participation across our groups. [↑](#footnote-ref-3)
4. The interactions in Study 3 held when controlling for time spent away from sport prior to the study. [↑](#footnote-ref-4)
5. Based upon Willegers, M., & Woodman, T. (2022). It is so much more than that: An attachment perspective on athletes’ relationship with their activities. Manuscript in preparation. [↑](#footnote-ref-5)
6. Based upon Willegers, M., & Woodman, T. (2022). Shelter me from the storm: An attachment perspective on individuals’ relationship with their activities. Manuscript in preparation. [↑](#footnote-ref-6)
7. For scale McDonald’s omega scores see tables 5-9. [↑](#footnote-ref-7)
8. Using the same analytical strategy, we developed short-form versions of both the RASS (12 items) and RESS (18 items). The results from both the full and short-form RASS and RESS mostly mimicked one another. We direct the interested reader to Appendix C for the short-form scale results. [↑](#footnote-ref-8)
9. The results for both the full and short-form RASS and RESS mostly mimicked one another. We direct the interested reader to Appendix D and E for the short-form scale results. [↑](#footnote-ref-9)