

Self-Compassion and Psycho-Physiological Reactivity and Recovery from Recalled Sport
Failure

By

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Abstract

Failure inherent to high-performance sport can precipitate emotional distress that can impair athletes' performance and physical and mental health. Identifying factors that allow athletes to manage failure to sustain their health is critical. Self-compassion (SC), treating oneself kindly in response to failure, buffers against negative affective responses. Whether SC impacts physiological responses to failure among athletes is unknown. Further, fear of self-compassion, an active resistance to extending compassion towards the self, can be detrimental to athletes' mental health and coping. However, whether fear of self-compassion accounts for unique variance in psychological and physiological responses to failure beyond SC is unknown. The purpose of this study was to i) examine the influence of SC on athletes' physiological (reactivity and recovery) and psychological responses when recalling a sport failure and ii) to explore whether fear of self-compassion accounted for unique variance in these outcomes, beyond SC. Participants ($N=91$; M age=21) were university or national-level athletes. In this laboratory-based, observational study, athletes were connected to a multi-modal biofeedback system to measure physiological responding at baseline, during a stress induction (imagining a past performance failure), and during a recovery period. Physiological recovery was assessed according to athletes' respiration rate, heart rate variability (SDNN), skin conductance and heart rate during the recovery phase, relative to their baseline scores. To assess psychological reactivity, athletes completed a series of scales (behavioural reactions, thoughts, and emotions). Hierarchical regression analyses revealed that SC was associated with adaptive behavioural reactions ($\beta = .46, p < .01$), and negatively associated with maladaptive thoughts ($\beta = -.34, p < .01$) and negative affect ($\beta = -.39, p < .01$). SC was not associated with physiological reactivity but associated with an aspect of athletes' reactivity, heart rate variability during the recovery

phase, relative to their baseline scores ($\beta = .37, p < .01$). Fear of self-compassion did not account for any unique variance in physiological outcomes but accounted for variance above SC in some maladaptive thoughts and behaviours ($\beta = -.26, p = .04$). Results suggest that SC promotes adaptive physiological and psychological responses in athletes relative to a recalled sport failure and may have implications for performance enhancement, recovery and health outcomes. Further, fear of self-compassion deserves attention in sport, given it's potential to predict maladaptive psychological outcomes beyond SC.

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Chapter I

Introduction

In recent years, high-profile elite athletes have broken the silence about their struggles with maintaining their mental well-being in a high-performance sport environment. Highly accomplished athletes, such as multiple Olympic medalists Allison Schmitt and Clara Hughes, have spoken about the difficulties that they have encountered when trying to maintain their mental health in high-performance sport (Ford, 2016; Hughes, 2015). According to their accounts, the culture of high-performance sport is problematic, as it places an ultimate emphasis on winning, is critical of those who fail, and endorses being tough in the face of hardships (Ford, 2016, Hughes, 2016). This culture that is founded upon expectations to win at all costs, to push through pain, and to be criticized in the face of failure can mask mental health issues and make it challenging for athletes to cope effectively with stress and performance setbacks (Bauman, 2016; Ford, 2016; Hughes, 2016; Putukian, 2016). These athletes argue that mental health concerns are real issues for athletes in competitive sport, and that athletes' mental well-being requires the same attention as their physical body. One factor that makes it challenging for athletes to maintain their mental well-being in sport is performance failure, which is a salient experience for athletes (Davis et al., 2007; Smith, Kass, Rotunda, & Schneider, 2006). Given the significant time and energy that athletes invest in their sport performance and the intense pressures that they feel to achieve optimal performance, performance failures pose coping and recovery difficulties for many athletes (Davis et al., 2007; Rumbold, Fletcher, & Daniels, 2012).

Self-compassion (SC) may buffer against the affective responses to failure and stress associated with sport. SC involves treating oneself with the same kindness, warmth and understanding in times of suffering, as one would offer to a good friend (Neff, 2003a). SC

predicts psychological well-being, emotional regulation, the ability to cope with failures, and adaptive physiological functioning (Adams & Leary, 2007; Allen & Leary, 2010; Arch et al., 2014; Breines & Chen, 2012; Leary, Tate, Adams, Allen, & Hancock, 2007; Neff, 2003a, 2003b; Raes, 2011; Svendsen et al., 2016; Terry & Leary, 2011; Terry, Leary, Mehta, & Henderson, 2013). The existing research about SC in the sport domain shows that it is beneficial for athletes' well-being and recovery (Mosewich, Kowalski, Sabiston, Sedgwick, & Tracy, 2011, Mosewich, Crocker, Kowalski, & DeLongis, 2013; Ferguson, Kowalski, Mack, & Sabiston, 2015; Reis et al., 2015).

Given that the environment of high-performance sport can foster competitiveness, comparison and evaluation, it is possible that athletes may fear or be resistant to SC, which may seem at odds with being a competitive athlete. Fear of self-compassion involves an active resistance to extending compassion to oneself (Gilbert, McEwan, Matos, & Rivis, 2011) and may play a role in athletes' resistance to adopting SC. Fear of self-compassion is an overlapping but distinct construct from SC and may be especially problematic in the context of high-performance sport. More research is needed in order to understand the extent to which SC and fear of self-compassion play overlapping versus unique roles in athletes' responses to failure.

Most research that addressed the role of SC and fear of self-compassion on athletes' responses to failures in sport has examined these constructs and their association with self-reported responses (e.g., affect, behaviour and cognitions). There is some evidence to suggest that SC and fear of self-compassion can impact physiological health (Arch et al., 2014; Longe et al., 2010; Rockliff, Gilbert, McEwan, Lightman, & Glover, 2008; Svendsen et al., 2016). Chronic stress (due to rumination or self-criticism) can impair physiological health and increase one's vulnerability to psychopathology (McEwen & Wingfield, 2003; Juster, McEwen, &

Lupien, 2010). Given the alleviating role that SC plays in ruminative thinking and self-criticism, and its positive connection to emotional regulation, it makes sense that SC has been linked to physiological markers of adaptation and emotional health (Arch et al., 2014; Svendsen et al., 2016). On the other hand, researchers have found negative associations between fear of self-compassion and physiological health (Longe et al., 2010; Rockliff et al., 2008). To date, the associations between SC, fear of self-compassion and physiological health have not been examined in athletes.

In the remainder of this chapter, I will outline the existing literature about the impact of sport failure on athletes' well-being. Next, I will define the construct of SC, review the existing literature, and I will discuss the implications of SC for athletes. Further, I will propose the importance of adopting SC when athletes encounter a sport failure. I will also introduce the concept of fear of self-compassion, a potential barrier to adopting SC, and discuss how it effects health and well-being and may do so in a unique way than SC. Subsequently, I will provide an overview of psychophysiological recovery from stress and discuss the health and performance implications of failing to effectively recover from stress. Finally, I will propose a link between self-compassion, fear of self-compassion and psychophysiological recovery from failure, and discuss the implications of this relationship in athletes.

Literature Review

The Impact of Sport Failure

Amid a general growing appreciation for mental health, the context of high-performance sport is increasingly recognized for the mental health challenges it can pose for athletes.

According to researchers, the culture of high-performance sport can demand that athletes

perform under pressure, sustain optimal performance, and endure the consequences of failing to meet expectations (i.e., lost playing time; withdrawn financial support) (Bauman, 2016; Davis & Sime, 2005; Ford, 2016; Rumbold et al., 2012). Athletes often train through pain, distress and injury, and are encouraged to – and even reinforced for - taking extreme measures in the pursuit of success (Bauman, 2016; Hammond, Gialloredo, Kubas, & Davis, 2013; Reardon & Factor, 2010). Further, it is a prevailing assumption that elite sport performance is indicative of optimal health, and that only ‘mentally tough’ athletes can achieve top performance (Bauman, 2016; Hammond et al., 2013). Given this culture, it is not surprising that athletes experience equal or greater instances of mental health concerns than the general population (Hammond et al., 2013; Reardon & Factor, 2010). This estimate likely under-represents the true state of mental health problems among athletes given that athletes’ mental health issues are often discounted, overlooked or go undetected (Reardon & Factor, 2010).

Researchers argue that the frequent failure experiences inherent to high-performance sport may be one factor that contributes to poor mental health among athletes (Davis et al., 2007; Hammond et al., 2013; Mosewich, Crocker, & Kowalski, 2014; Putukian, 2015). Failure is often the rule rather than the exception for high-performance athletes, who are constantly working toward challenging goals and performance standards (Davis et al., 2007; Galli & Gonzalez, 2015; Smith et al., 2006). The pressures that athletes feel to perform well, combined with the significant investment of time and energy that is required to participate in high-performance sport makes accepting and coping with failures challenging for athletes. Many athletes report feeling a diminished sense of self and emotional distress following performance failure (Davis et al., 2007; Sagar, Lavalley, & Spray, 2007; Sutherland et al., 2014).

The emotional distress that athletes report following failure often takes the form of self-criticism, self-blame, obsession and rumination (Ferguson, Kowalski, Mack, & Sabiston, 2014; Mosewich et al., 2013; Mosewich et al., 2014; Sutherland et al., 2014). In fact, many athletes believe that self-criticism is necessary for success in elite sport, and that failure to respond in this way will lead to complacency or mediocrity (Ferguson et al., 2014; Rodriguez & Ebbeck, 2015; Sutherland et al., 2014). Given this prevailing mindset of mental toughness and self-criticism, many athletes find it difficult to adhere to advice that they should be gentler on themselves, adjust their goals, or decrease their training loads. Athletes themselves often discount their vulnerabilities or are reluctant to come forward with their challenges to avoid stigmatization or being seen as incapable (Bauman, 2016; Hammond et al., 2013; Reardon & Factor, 2010; Sagar et al., 2007). Instead, athletes often train through pain, distress or injury, criticize and blame themselves, and continue to expect perfection from themselves (Akehurst & Oliver, 2014; Mosewich et al., 2014; Rodriguez & Ebbeck, 2015) in the belief that such dedication to their training is necessary for success. Even more problematic is the finding that when athletes exhibit these types of behaviors in a quest for success (e.g., relative hyperactivity, hypervigilance, or “pushing through” pain or struggle) these behaviours are often reinforced (Reardon & Factor, 2010).

When athletes respond to performance failure with self-criticism and rumination, they do so at a cost. Researchers have found that this response pattern to failure inhibits self-regulation, impairs emotional recovery, impedes stress management strategies and undermines performance (Ferguson et al., 2015; Mosewich et al., 2014; Powers, Koestner, Lacaille, Kwan, & Zuroff, 2009; Tenenbaum, Basevitch, Gershgoren, & Filho, 2013). For instance, Powers, Koestner, Lacaille, Kwan and Zuroff (2009) found that athletes and performers who were particularly hard

on themselves experienced significantly more negative affect when their goal progress was impeded relative to those who were lower in self-criticism. Further, self-critical athletes may be hypersensitive to critique or judgement and perceive failure as threatening, and therefore, exhibit emotional reactivity, avoidance and fear of failure (Powers et al., 2009; Sagar et al., 2007). Given that this maladaptive pattern of responding to setbacks promotes negative affect and impairs coping, it is not surprising that responding in this way increases athletes' vulnerability to sustaining psychological distress and developing psychopathology (Juster et al., 2010; Powers et al., 2009; Tenenbaum et al., 2013). Performance failures have been linked to increased depressive symptoms, depressed mood, anger and decreased vigor (Hammond et al., 2013; Jones & Scheffield, 2008). In fact, Davis et al. (2007) found that having athletes view videos of past performance failures induced a depressed state in the brain. Considering the tendency of athletes to be hard on themselves in the face of failure and the cost associated with this response, it is important to identify factors that allow competitive athletes to maintain perspective and manage performance failure in a way that sustains their well-being and mental health.

Self-Compassion

Self-Compassion (SC) is a relatively stable (Neff, 2003b), but malleable (e.g., Johnson & O'Brien, 2013; Kelly, Zuroff, Foa, & Gilbert, 2010; Leary et al., 2007) quality that may help athletes effectively cope with failures. Stemming from Buddhist philosophy (Neff, 2003), SC involves treating oneself with the same kindness and understanding as one would a close friend during times of struggle. This construct involves three components: (1) kindness versus self-judgement, (2) mindfulness versus over identification and, (2) common humanity versus isolation (Neff, 2003). Self-kindness, the first component, involves offering oneself care and concern in the face of failures or difficulties versus harsh criticism or blame. Mindfulness entails

viewing one's failures or shortcomings in an open and balanced way. Common humanity is the act of accepting that failure is a shared human experience (Neff, 2003). When faced with a personal failure, people high in self-compassion employ the three components harmoniously, in order to cope with and adapt to difficult situations. For example, if an athlete made a costly mistake during a competition, a self-compassionate response would involve the exercise of the three components of self-compassion. In exercising mindfulness, an athlete would be open to and would acknowledge the hurt that she feels (e.g., "This really hurts"), rather than avoiding or disconnecting from their pain, or over identifying with their suffering. The athlete would also exercise self-kindness through expressing a desire and effort to alleviate her own suffering by offering herself tenderness and support (e.g., "I made a mistake, but I can be kind to myself. May I forgive myself"), versus harsh self-criticism. Finally, she would view her own suffering as a part of the common human experience (e.g., "Even the best athletes make mistakes. All athletes do."), as opposed to feeling alone in her struggle (common humanity).

SC has been examined in a number of domains (e.g., academic settings, chronic disease management, and parenting) and professional settings (i.e. health care educators, providers and caregivers); see Beaumont, Irons, Rayner, & Dagnall, 2016 for a review; Neff & Faso, 2014; Neff, Hsieh, & Dejitterat, 2005; Sirois & Rowse, 2016), and among a variety of samples, including clinical samples (i.e., eating disorder patients and individuals with psychological disorders; see Braun, Park, & Gorin, 2016 for a review; MacBeth & Gumley, 2012), exercisers (Magnus, Kowalski, & McHugh, 2010), and smokers (Kelly et al., 2010). Across these different contexts, SC consistently predicts positive aspects of well-being and psychological health (i.e., life satisfaction, happiness, and optimism) and buffers against psychopathology (e.g., anxiety and depression) and mental health symptoms (Barnard & Curry, 2011; Johnson & O'Brien, 2013;

MacBeth & Gumley, 2012; Neff, 2003, Neff, 2003b; Raes, 2011). Further, dispositional SC associates with positive personality traits (agreeableness, extraversion and conscientiousness) and negatively relates to neuroticism (Neff, Rude & Kirkpatrick, 2007). Moreover, SC accounted for positive aspects of well-being (e.g., optimism, happiness, positive affect, wisdom and exploration), beyond the effects of personality characteristics, suggesting that SC can impact other aspects of well-being that personality traits cannot (Neff et al., 2007). The adaptive and protective qualities associated with SC may be due to the negative association between SC and other correlates of poor well-being and mental health disorders (e.g., anxiety, negative affect, rumination, shame and neuroticism; Allen & Leary, 2010; Barnard & Curry, 2011; Johnson & O'Brien, 2013; Leary et al., 2007; Neff, 2003; Neff et al., 2005; Neff & Vonk, 2009).

Additionally, SC promotes motivation and persistence towards one's goals. For example, among female exercisers, Magnus, Kowalski and McHugh (2010) observed that SC predicted intrinsic motivation, and negatively predicted social physique anxiety and obligatory exercise. Other researchers found that having high levels of SC reported greater perceived competence and mastery goals (which are marked by greater persistence and enjoyment), and less avoidance goals, fear of failure, and anxiety compared to those lower in SC (Magnus et al., 2010; Neff et al., 2005). Taken together, these findings suggest that having high levels of SC predicts well-being and adaptive outcomes in the pursuit of one's goals.

Self-Compassion and Coping with Failures

It is in the face of failure that SC appears to be especially helpful. Researchers argue that SC provides emotional safety in times of failure that allows individuals to see their shortcomings in an open and balanced way, without feeling threatened, avoiding failure or needing to boost themselves up as a means of coping with the failure (Allen & Leary, 2010; Neff et al., 2005).

Research supports these proclamations; in the face of set-backs (i.e., following academic and exercise failures or moral transgressions, when confronting personal weaknesses or receiving negative feedback about a performance) individuals higher in SC demonstrate more accurate self-appraisals, and experience less avoidance, negative affect and rumination, than those lower in SC (Breines & Chen, 2012; Leary et al., 2007; Neff et al., 2005; Semenchuk, Strachan & Fortier, 2018). Being mindfully aware of one's shortcomings allows self-compassionate individuals to learn from their mistakes and prevents them from overidentifying with their flaws or denying or suppressing them (Neff, 2003a; Neff et al., 2005; Neff et al., 2007). In turn, self-compassionate people take responsibility for their role in a negative event, view their shortcomings as more changeable, are motivated to improve them, approach (vs. avoid) the problem, and are more likely to seek support from someone who can help them improve (Breines & Chen, 2012; Neff et al., 2005; Neff et al., 2007; Terry et al., 2013; Zhang & Chen, 2016). Thus, it is not surprising that having high levels of SC is positively associated with enhanced emotional coping skills, adaptive emotional regulation and ability to repair negative emotional states (Arch et al., 2014; Arimitsu & Hofmann, 2015; Neff, 2003b; Neff et al., 2005; Terry & Leary, 2011). Taken together, existing research findings suggest that SC equips individuals to face the experience of failure, and cope effectively.

Not only does SC help individuals cope effectively with failure, but it is possible that highly self-compassionate individuals may welcome and embrace challenges. People with high levels of SC exhibit high levels of curiosity and exploration and low fear of failure (Neff et al., 2005; Neff et al., 2007). The finding that SC promotes openness to challenges is consistent with the finding that SC is negatively associated with avoidance-oriented coping strategies and passivity, and positively associated with personal initiative and motivation for improvement

(Breines & Chen, 2012; Neff et al., 2005; Neff et al., 2007; Zhang & Chen, 2016). Therefore, relating to oneself with SC offers an adaptive way to cope with and possibly benefit from the experience of failure.

Self-Compassion in Sport

Given that SC is associated with adaptive coping in the face of failures, researchers have examined the influence of SC in athletes, for whom performance failures are part of the sport experience. These researchers have found that the benefits associated with SC transfer to athlete samples. Athletes with higher levels of SC show superior psychological well-being, experience more authentic pride (an adaptive manifestation of pride that is generated from a specific achievement or positive behaviour that is attributable to internal, unstable, and controllable causes; Tracey & Robins, 2007), meaning and vitality relative to their sport and report less anxiety, fear of failure, fear of negative evaluation and shame than those lower in SC (Ferguson et al., 2014; Ferguson et al., 2015; Huysmans & Clement, 2017; Mosewich et al., 2011). The adaptive qualities observed in athletes with high levels of SC suggest that being self-compassionate equips athletes to absorb the benefits of their sport involvement, and to thrive in the face of challenges that are innate in competitive sport.

Indeed, SC has been shown to help athletes cope when they encounter failures or setbacks. Female athletes higher in SC demonstrated greater positivity, perseverance, eudemonic well-being and lower passivity and avoidance coping in response to emotionally challenging sport scenarios compared to those lower in SC (Ferguson et al., 2014; Ferguson et al., 2015; Huysmans & Clement, 2017; Reis et al., 2015). A study by Reis et al. (2015) revealed that SC negatively predicted negative affect and personalizing thoughts and was related to behavioral

equanimity in response to hypothetical and recalled stressful sport scenarios. In fact, Ferguson and colleagues (2014) found that the relationship between SC and psychological well-being (a construct that represented autonomy, mastery, personal growth, positive relatedness, purpose and self-compassion) was mediated by reduced passivity and greater initiative. This finding supports the notion that athletes who are self-compassionate are motivated to and act towards improving themselves and achieving their optimal health and well-being (Neff, 2003; Neff, 2003b, Zhang & Chen, 2016). Finally, an intervention that successfully increased female athletes' levels of SC resulted in reduced state self-criticism, rumination and concern over mistakes in response to recalled setbacks (Mosewich et al., 2013). These findings demonstrate that adopting SC in times of failure serves as a protective factor that helps athletes to maintain perspective and well-being during challenging sport experiences (Ferguson et al., 2014, 2015; Mosewich et al., 2014).

While the benefits of SC are noted in sport, it is important to continue to explore the role that SC plays in helping athletes cope with performance failures. Athletes remain hesitant to offer themselves compassion, as doing so would be contradictory to the (supposed) formula for success: To push through pain, be mentally tough, and to beat themselves up when they fail (Rodriguez & Ebbeck, 2015; Sutherland et al., 2014). In light of these resistant attitudes, it is important to consider factors that discourage athletes from being self-compassionate.

Fear of Self-Compassion

Despite evidence that being self-compassionate in times of suffering can yield many psychological benefits, many people report feeling significant discomfort and anxiety when considering this approach. Gilbert and Procter (2006) discerned that when trying to offer oneself compassion, many people are met with resistance and fear. In fact, Neff (2003b) tapped into this concern during her initial testing of the Self-Compassion Scale, where she found that many

participants reported concerns that being too self-compassionate may be a way of avoiding responsibility. In order to understand the resistance that some people face when trying to be self-compassionate, Gilbert and his colleagues (2011), developed the Fear of Self-Compassion Scale. Fear of self-compassion involves an *active resistance* to extending compassion toward oneself during difficult times (Gilbert et al., 2011). While it may appear as though fear of self-compassion and SC are opposite sides of the same coin, studies that have examined both constructs discern that they are correlated but not completely overlapping constructs, sharing about half to slightly more than half of their variance (r values ranging from $-.54$, $r = -.63$; Ferguson et al., 2015; Gilbert et al., 2011; Joeng & Turner, 2015; Kelly, Carter, Zuroff, & Borairi, 2013). Gilbert and colleagues (2010) argue that fear of self-compassion is not simply the absence of SC. What sets it apart from SC is the presence of an active resistance to SC when fear of self-compassion is present. While SC and fear of self-compassion are related constructs, they may exert unique effects. Thus, understanding individuals' levels of fear of self-compassion should accompany the study of SC (Gilbert et al., 2011). Further, given the relatively little research that has been conducted in the area of fear of self-compassion, determining the extent to which these two constructs are unique versus overlapping is warranted.

Researchers who study fear of self-compassion have demonstrated its association with a number of maladaptive psychological correlates. Having high levels of fear of self-compassion is positively linked to feelings of inadequacy, self-hatred, fear of receiving compassion from others, and anxious attachment style, and negatively related to self-reassurance and feelings of importance to others (Joeng & Turner, 2015; Gilbert et al., 2011). This suggests that high levels of fear of self-compassion can impair people's abilities to relate to themselves and others in a safe and healthy way. Having high fear of self-compassion may be especially problematic due to

this variable's strong association with self-criticism, which significantly predicts psychopathology (Joeng & Turner, 2015; Gilbert, Baldwin, Irons, Baccus, & Palmer, 2006; Gilbert et al., 2011). Further, individuals who are highly self-critical will typically respond to setbacks with harsh self-criticism that is powerful and pervasive, and experience greater difficulty generating feelings of self-reassurance and warmth compared to those lower in self-criticism (Gilbert et al., 2006).

Athletes may be especially prone to fear of self-compassion, given that fear of self-compassion can be amplified in highly competitive environments (Gilbert, 2014; Gilbert et al., 2011). Indeed, evaluation and competition are paramount in sport contexts (Mosewich et al., 2011). Athletes' careers depend on them being able to attain and sustain optimal performance, and often they are criticized and penalized when they fail (Bauman, 2016). Athletes report feeling significant internal and external pressures to meet performance expectations and ultimately perfection, which they feel that they could not achieve without self-criticism (Ferguson et al., 2014; Mosewich et al., 2013). The evaluative and competitive nature of high-performance sport underscores the importance of investigating fear of self-compassion in a sport context.

Only one study, to my knowledge, has explored the role of fear of self-compassion in athletes. Researchers found that athletes with high levels of fear of self-compassion responded to hypothetical failure scenarios with self-criticism and passivity (Ferguson et al., 2015). Further, fear of self-compassion in athletes negatively predicted well-being (i.e., autonomy, personal growth, environmental mastery, self-acceptance, positive relations and purpose in life) through self-criticism (Ferguson et al., 2015). These findings show that active resistance to extending compassion towards oneself is detrimental to athletes' psychological well-being and ability to

cope with failures. Given these preliminary findings, further research is needed to replicate and more fully understand the role of fear of self-compassion in athletic performance and well-being (Ferguson et al., 2015).

Physiological Recovery

To date, what we know about the buffering effects of SC on stress has relied largely on self-report methods. However, encountering psychological stress also has physiological implications that can be detected by changes in the body's systems. The autonomic nervous system plays an integral role in responding and adapting to changing stimuli in the environment. Responsiveness from two divisions of the autonomic nervous system, the sympathetic and parasympathetic divisions, represents excitatory/mobilization and recovery/restoration processes in the body, respectively (Porges, 2007; Thayer, Ahs, Fredrikson, Sollers, & Wager, 2012; Thayer & Sternberg, 2006). The dominance (inhibition) of these systems can depend upon whether or not we perceive our environment as safe (Porges, 2007; Thayer & Lane, 2000). A typical response to threatening or novel stimuli, real or imagined, involves disinhibition of the sympathetic nervous system (which is typically inhibited in favour of parasympathetic dominance), responsiveness from various brain structures (i.e., the amygdala, prefrontal cortex, and hippocampus) and elicitation of biological and behavioral responses (i.e., the fight-or-flight response), in order to adapt to the stressor (Dupee, Werthner, & Forneris, 2015; Juster et al., 2010; Thayer & Lane, 2009). This state is associated with excitatory or mobilization responses such as increased muscle tension, faster breathing, sweating, and increased heart rate (Robazza, Pellizzari, Bertollo & Hanin, 2008; Tenenbaum et al., 2013; Thayer & Lane, 2009). For instance, changes in skin conductance (sweat) response are associated with sympathetic activation; increases in the electrodermal response during or following a task can indicate excessive worry

or ruminative thinking (Bertollo et al., 2013; Magalhaes, Montgomery, Magalhaes, & Ngin, 2014). Heart rate variability, the variation in beat-to-beat intervals of the heart beat (Porges, 2007), also reflects autonomic activity, at rest or in response to environmental changes. When stressed, the sympathetic nervous system's influence on the heart becomes disinhibited, and heart rate variability decreases, which reflects a less adaptable and flexible state (Porges, 2007; Thayer & Lane, 2009; Thayer et al., 2012). Thus, examining changes in the body's physiological parameters can provide insight into changes in activation and inhibition of the two divisions of the autonomic nervous system, which may be due to exposure to stress.

Fluctuations in dominance of the parasympathetic and sympathetic divisions of the autonomic nervous system and the physiological changes that accompany these shifts, are natural and beneficial in the short term. McEwen and Wingfield's (2003) theory of allostasis provides a framework to understand these physiological implications and the importance of having effective strategies to recover from them. Allostasis reflects the body's dynamic and adaptive responses to changing environmental stimuli where the goal is to match one's environmental demands with available bodily resources and maintain homeostasis in the body's systems (McEwen & Wingfield, 2003; Thayer & Lane, 2009). When an individual perceives the environment as safe, the body's systems operate in such a way that promotes conservation, recovery, regeneration and homeostasis in the body's systems (McEwen & Wingfield, 2003; Porges, 2007; Thayer et al., 2012; Thayer & Sternberg, 2006). This state is characterized by appropriate inhibition of the autonomic nervous system, primarily influenced by the parasympathetic system, and results in slowed heart rate, lowered blood pressure and cortisol response, relaxed muscles and affiliative actions and behaviours (e.g., listening, eye contact, and approach behaviors; Porges, 2007; Thayer et al., 2012; Thayer & Sternberg, 2006). Ideally, when an individual is faced with

threatening stimuli (stress), real or imagined, complementary responsiveness from the autonomic nervous system (disinhibition of sympathetic and inhibition of parasympathetic influences) and various brain structures elicits appropriate responses in order to accommodate the stressor and maintain balance in the body's systems (Dupee et al., 2015; Juster et al., 2010; Thayer & Lane, 2009). Thus, allostasis involves dynamic and efficient use of the body's resources, and flexible, context-appropriate adaptation to one's environmental demands (McEwan & Wingfield, 2003; Thayer & Sternberg, 2006; Thayer et al., 2012). Optimal health is characterized by complementary and adaptive processes from the brain, the body and the nervous system (Juster et al., 2010; Porges et al., 2007).

According to allostatic theory, allostatic responses are necessary and beneficial in the short term, but are detrimental to health and well-being if stress responses are maintained for long periods of time. In this case, a state known as allostatic load develops. Allostatic load is a consequence of chronic stress or poor recovery; in these situations, the sympathetic nervous system is locked into a state of disinhibition and is not longer able to return to baseline (McEwan & Wingfield, 2003; Thayer & Sternberg, 2006). An allostatic state can also be the product of failing to dismiss threat when a threat is no longer present, due to chronic worry, self-criticism or rumination (Gilbert, 2014; Thayer & Sternberg, 2006; Thayer et al., 2012). Sustained activation of the sympathetic nervous system, the body's stress response, can amount to a state of allostatic load and has deteriorating health implications (i.e., burnout, psychopathology, cardiovascular disease and illness; see Juster et al., 2010 for a review; Thayer & Sternberg, 2006).

Physiological makers can reflect allostatic load, or the failure of the body's systems to recover from stress. For example, low resting heart rate variability is indicative of emotional arousal or dysregulation, predicts a negativity bias (the tendency to be overly attentive to

negative or threatening stimuli and neglect safety signals) and, perhaps not surprisingly, is considered a marker for disease and mortality (Porges, 2007; Thayer & Lane, 2009; Thayer & Sternberg, 2006). In contrast, high resting heart rate variability predicts optimal emotional regulation, approach versus avoidance behaviours, cognitive performance, executive functioning and psychological and physical health (Thayer & Lane, 2009; Thayer et al., 2012). This makes sense, given that a healthy system is flexible to changing demands (high variability), and is not “locked in” to beat with absolute regularity (Thayer & Sternberg, 2006). Thus, by examining physiological markers, we can gain an understanding of the body’s state of responsiveness to environmental demands and well-being.

Failure to effectively regulate sympathetic nervous system activation due to stress or negative emotions (i.e., allostatic load) also impedes performance. That is, prolonged stress due to ruminative thinking, obsession or harsh self-criticism that many athletes feel facilitates performance (Ferguson et al., 2014; Mosewich et al., 2014), can undermine optimal performance. Poor performance is most often characterized by dysfunctional emotional or physiological symptoms (i.e., negative thinking, doubt, and tension) and increased cognitive anxiety (Davis & Sime, 2005; Robazza et al., 2008; Tenenbaum et al., 2013). Further, prolonged stress, increased somatic and cognitive arousal and negative thinking or criticism inhibits coordination, decision making, response time and interferes with automatic skill execution (Bertollo et al., 2013; Davis & Sime, 2005; Tenenbaum et al., 2013). Contrastingly, researchers who study top performing athletes revealed that champion athletes demonstrated exceptional physiological regulation and relaxation ability, greater hope, adaptive perfectionism and optimism and less negative thinking and worry about mistakes (Dupee et al., 2015; Gould, Dieffenbach, & Moffett, 2002). Athletes who improved their ability to regulate their body’s

responses to stress exhibited lasting performance gains in basketball skills testing, in addition to increased self-efficacy and reduced state anxiety (Paul & Garg, 2012). Indeed, the body's physiological state influences behaviour, psyche and performance (Dupee et al., 2015; Porges, 2007). Therefore, identifying factors that effectively regulate sympathetic nervous system activity in response to stressful stimuli, such as performance failure, is critical for optimal health and performance (Dupee et al., 2015; Juster et al., 2010).

There is some evidence that SC promotes healthy baseline physiological functioning and physiological regulation. Svendsen and colleagues (2016) found that high levels of dispositional SC were associated with higher heart rate variability (assessed over a 24-hour period), an indicator of heart function and emotional adaptation (Thayer et al., 2012; Thayer & Sternberg, 2006), in a sample of university students. Additionally, other researchers have shown that both dispositional (Breines et al., 2015) and increased (Arch et al., 2014) levels of SC attenuated participants' sympathetic nervous system activity (stress reactivity) during and following an exposure to a laboratory stressor (public speaking and arithmetic). Relatedly, experimentally inducing a compassionate state, using compassion-focused imagery, increased participants' heart rate variability and reduced cortisol responding, suggesting that SC could stimulate a soothing affect system in the body (Rockliff et al., 2008). A possible caveat to the benefits of SC may be the presence of fear of self-compassion. Some researchers have observed that individuals who are highly self-critical (associated with high fear of self-compassion; Gilbert et al., 2011; Kelly et al., 2013) exhibit particularly problematic physiological response patterns to stress. Researchers have observed that individuals with high levels of self-criticism showed a threat response in the brain and body (low heart rate variability) when trying to be self-assuring (Longe et al., 2010;

Rockliff et al., 2008). These findings point to the importance of the continued examination of the implications of SC and fear of self-compassion on physiological regulation and well-being.

The advantageous effects that SC (and the harmful effects that fear of self-compassion and self-criticism) can have on psychological and physiological health may be due, in part, to underlying physiological responses that are activated when someone is being self-critical or self-soothing. Given that the brain and nervous system respond similarly to internally generated images as to external stimuli, individuals who respond to failures with critical self-attacks may activate similar affect pathways as when they are being attacked by another person or experiencing a threatening event. That system is the threat-defense system which is linked to the sympathetic nervous system (Gilbert, 2014; Gilbert & Irons, 2005; Gilbert et al., 2006). Thus, responding to failure with self-criticism and rumination may promote sustained activation of the threat-defense system via the sympathetic nervous system. This sustained activation of the body's threat response can promote the development of allostatic load in the body's systems, thereby increasing one's vulnerability to developing psychopathology and illness (Gilbert et al., 2014; Juster et al., 2010; Karatsoreos & McEwen, 2011; McEwen & Wingfield, 2003; Thayer & Sternberg, 2006). On the other hand, responding to stress with SC appears to encourage adaptive physiological processes (i.e., high heart rate variability and low cortisol), that reflect allostasis (Arch et al., 2014; Rockliff et al., 2008; Svendsen et al., 2016). Thus, SC may support physiological and psychological well-being through promoting adaptive physiological responses to stress and failure.

While it has been shown that SC is correlated with adaptive physiological functioning (Arch et al., 2014; Breines et al., 2015; Rockliff et al., 2008; Svendsen et al., 2016), this association has not been explored in athletes. The reliance on the SC literature on self-reported

measures of distress and coping is a limitation of the existing SC in general, and this limitation extends to the sport domain. To my knowledge no studies to date have examined the factors that promote adaptive physiological recovery from failures in athletes and have relied solely on self-report of psychological measures. While SC may help to facilitate this process, it is possible that fear of self-compassion may act as a barrier to effective physiological regulation. Understanding athletes' psychological and physiological responses to stress, and their abilities to cope with and recover from said stress, is crucial in order to optimize performance and health (Dupee et al., 2015; Mosewich et al., 2014; Nicholls & Polman, 2007).

Research Questions and Hypotheses

Consideration of the aforementioned review of literature shows that SC is beneficial for athletes' psychological health and performance. Moreover, fear of self-compassion may be detrimental to athletes' well-being. However, there is limited research addressing role of SC and fear of self-compassion in athletes' psychological and physiological reactivity and recovery from sport failure. Thus, this study's **primary purpose** was to explore the influence of SC on athletes' *physiological* reactivity and recovery when recalling a sport failure. A **secondary purpose** was to examine *psychological* reactivity to this same sport failure, relative to SC, in order to replicate past findings. Another **secondary purpose** was to examine whether fear of self-compassion explained any unique variance in study outcomes, over and above SC.

By conducting this study, I aimed to answer the following research questions:

Question 1: Does SC relate to athletes' physiological reactivity and recovery from an imagined sport failure?

Hypothesis 1: I hypothesized that athletes' levels of SC would be negatively associated with physiological reactivity, and positively associated with physiological recovery following the failure induction.

Question 2: Does SC relate to athletes' psychological reactivity (i.e., behavioural reactions, thoughts and emotions) to a recalled sport failure?

Hypothesis 2: Athletes' levels of SC would be positively associated with adaptive behavioural reactions and negatively associated with maladaptive thoughts and negative emotions pertaining to the recalled sport failure.

Question 3: Does fear of self-compassion predict unique variance in athletes' physiological and psychological reactivity and recovery respectively from a recalled sport failure, beyond SC?

Hypothesis 3: Fear of self-compassion should predict unique variance in markers of physiological reactivity and recovery and psychological recovery, over and above SC. I expected the relationship between fear of self-compassion and psychological and physiological reactivity to be positive, while the association with this variable and physiological recovery would be negative.

Chapter II

Methods

Design and Study Overview

The present study was a laboratory-based, observational study involving an online component followed by a laboratory session. Eligibility, demographic information and trait measures (e.g., Self-Compassion, Self-Esteem, and Fear of Self-Compassion) were gathered through an online questionnaire which occurred prior to a laboratory session. This online component reduced the time commitment of the athlete during the laboratory session. The

laboratory component involved the use of biofeedback technology and questionnaires which were used to assess athletes' physiological and psychological reactivity and recovery tendencies respectively.

Participants

Participants were 91 adult (18 years of age or older) competitive, varsity or national athletes. The choice to recruit from both males and females was premised on the fact that, to my knowledge, research about SC in the sport domain has focused primarily on female athletes (e.g., Ferguson et al., 2014; 2015; Mosewich et al., 2011; 2013; Reis et al., 2015). To be eligible, athletes were members of a university sports team for the 2017/2018 season, who had competed in their sport at the university or national level within the last year and indicated that they could recall a recent sport failure or setback that was distressing for them (see Appendix A). Varsity and national athletes (versus anyone who self-reported as an athlete) were chosen as they have sufficient competition exposure (to draw on sport failures from), and because the consequences of failing may be more salient (e.g., loss of scholarship funding). Participants were ineligible if they reported use of any substances or the following medications (i.e., medication for depression, anxiety, ADHD, or anabolic steroids, drugs or alcohol, antibiotics), had a clinically diagnosed psychological or cardiac disorder, or if they had recently experienced a head injury, as these factors may influence their stress response. (Lagos, Thompson, & Vaschillo, 2013; Prinsloo, Derman, Lambert, & Rauch, 2013; Svendsen et al., 2016).

Sample Size

Past research was considered when determining the sample size for this study. Only one study, to my knowledge, had used hierarchical regression analyses to determine the relationship

between baseline SC and physiological measures (i.e., resting heart rate variability) and the researchers found an effect size of .18, with a sample of $N=53$ (Svendsen et al., 2016). Given that no studies to date had examined the role of SC and physiological regulation in athletes (change in physiological measures in response to changing stimuli), past research that assessed some of the other measures that were included in this study (i.e., SC and psychological responses to setbacks) was also considered. For instance, Reis et al. (2015) used hierarchical regression analyses to determine if SC predicted psychological responding to a sport setback and found effect sizes to range from .30 (personalizing thoughts) to .35 (negative affect), with a final sample of $N=59$. Sample size was calculated using G*Power (Erdfelder, Faul, & Buchner, 1996). Using an alpha level of .05, a power level of .95, and an effect size of .20, I determined that I would need 90 participants to complete my study.

Measures

Baseline Measures.

Demographics. The following demographic measures were assessed: age, gender, current sport, sport history, year in sport at a university or national level, year in University, and University major. The demographic questionnaire can be found in Appendix B.

Self-Compassion. Self-compassion was assessed using the Self-Compassion Scale (Neff, 2003b; see Appendix C). This is a 26-item tool where participants responded on a 5-point Likert scale ranging from 1 (“almost never”) to 5 (“almost always”). Six subscales assess the three facets of self-compassion: mindfulness, self-kindness and common humanity, as well as the opposing facets: over-identification, self-judgement, and isolation, which all contribute to a final self-compassion score. Example items from the Self-Compassion Scale include “When things are

going badly for me, I see the difficulties as part of life that everybody goes through” (common humanity) and, “When I fail at something that’s important to me I tend to feel alone in my failure” (isolation). Negatively worded items are reverse scored. The mean of items for each subscale was created and then were summed to create an overall score of self-compassion. Higher scores on this scale indicate higher levels of self-compassion. The Self-Compassion Scale has good test-retest reliability, discriminant and concurrent validity and good internal consistency reliability ($\alpha = .92$) and has been found to be a reliable measure to use with athletic samples ($\alpha = .87$; Mosewich et al., 2011). In this study, the Cronbach’s alpha coefficient associated with this measure was .91 (26-items)

Fear of Self-Compassion. Participants’ fear of self-compassion was assessed using the 15-item Fear of Self Compassion Scale (FSCS; see Appendix D) developed by Gilbert and colleagues (2011). Participants were asked to rate their agreement with each statement (e.g., “Getting on in life is about being tough rather than compassionate”) on a five-point scale from 0 (“don’t agree at all”) to 4 (“completely agree”). Items on this scale are summed to represent an overall score. Higher scores on this scale indicate higher levels of fear of self-compassion. The FSCS has shown good internal consistency ($\alpha = .85, .95$; Gilbert et al., 2011; Kelly et al., 2013) and has been used previously with athletic samples (Ferguson et al., 2015). The Cronbach’s alpha coefficient for this measure within the current study was .89 (15-items).

Self-Esteem. While SC and self-esteem are highly correlated, SC predicts unique variance beyond self-esteem (Mosewich et al., 2011; Neff, 2003b; Neff & Vonk, 2009). Self-esteem is traditionally used as a control variable in research with SC and was used as such in this study (Johnson & O’Brien, 2013; Leary et al., 2007; Mosewich et al., 2011). Self-esteem was measured using the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965). This scale consists

of 10 items, five of which are positively worded (e.g., “I feel that I have a number of good qualities”), and five items are negatively worded (e.g., “At times, I think I am no good at all”). Negatively worded items were reverse scored. Participants indicated the extent to which they agreed with each statement on a scale from 1 (“strongly disagree”) to 4 (“strongly agree”). A total self-esteem score was calculated by summing responses from the 10 items. Higher scores represent higher levels of self-esteem. This scale can be found in Appendix E. The RSES has acceptable internal consistency reliability ($\alpha = .87$), predictive, concurrent, construct validity (Rosenberg, 1965), and acceptable psychometric properties when used with athletic samples (e.g., Mosewich et al., 2011). In this study, the Cronbach’s alpha coefficient for this scale was .82 (10-items) in this study.

Imagery Ability. Given that imagery ability may impact participants’ reactivity during the stress induction (Kwekkeboom, 2000), imagery ability was included as a possible control variable in this study. The Motivational General-Arousal (MG-A) subscale of the Motivational Imagery Ability Measure for Sport (MIAMS), was chosen in order to assess participant’s ability to generate emotional experiences associated with sport (e.g., anxiety) using imagery (Gregg & Hall, 2006). This subscale assesses participants ease of forming the image, and intensity of the emotional experience generated by the image. This scale can be found in Appendix A.1. Participants were asked to generate images associated with four different sport scenarios (e.g., feeling anxious before a sporting competition), and rate the ease of forming the image (4-items) and the emotional experience (4-items) created by the image on scale from 1 (“No emotion”) to 7 (“Very strong emotion”). Emotion and ease were assessed separately (Gregg & Hall, 2006). The MG-A subscale of the MIAMS has shown acceptable reliability in athletic samples ($\alpha = .74$

emotion; $\alpha = .73$ ease). In this study, I found a Cronbach's alpha of .70 for items making up the emotion subscale and .69 for items making up the ease subscale.

Lab Session.

Physiological Parameters. Participants' physiological parameters were assessed during the in-lab session and recorded throughout three phases: during a baseline phase, while the athlete was recalling a past sport failure, and during a recovery phase (see Procedures section for more detail). A ProComp Infiniti (Thought Technology, Montreal, Canada) multi-modal biofeedback system was used to assess the following physiological parameters: skin conductance (microsiemens), heart rate variability (standard deviation of the inter-beat intervals, SDNN; ms), muscle tension (electromyography, EMG; microvolts), skin temperature (degrees Celsius), heart rate (beats per minute; bpm), and rate of respiration (breaths per minute). This system has been used by other researchers and is a good method for assessing physiological changes in response to changing stimuli (e.g., Dupee et al., 2015; Paul & Garg, 2012; Shaw, Zaichkowsky, & Wilson, 2012; Wilson et al., 2006; Wilson & Sommers, 2011).

Recalled Sport Failure Scenario. Participants were prompted to imagine a past sport failure experience and underwent a guided imagery task in order to recall their experience. Imagining stressful scenarios or feelings has been shown to activate affective emotions and physiological systems (Gilbert et al., 2006; Gregg & Hall, 2006; Hackmann & Holmes, 2004; Lang, 1979; Leary et al., 2007). Recalled scenarios were used based on emerging evidence that they are more personally relevant, detailed and emotionally activating than hypothetical scenarios (Ferguson et al., 2015; Mclatchie, Giner-Sorolla & Derbyshire, 2016; Reis et al., 2015). The failure induction was developed based on recommendations for imagery best practice (see Gregg & Hall, 2006; Hammond, Gregg, Hrycaiko, Mactavish, & Leslie-Toogood, 2012; Lang,

1979) and by consulting with a sports imagery expert. The imagery script can be found in Appendix F. The imagery script, read aloud by the researcher for two minutes, provided additional prompts in order to promote elaboration of participant's images, and helped to ensure that they were thinking about the failure scenario for the duration of the failure induction.

Emotional Difficulty. Athletes rated how “emotionally difficult” the scenario was for them on a scale from 1 (“not at all”) to 6 (extremely). See Appendix G for this scale. This served as a manipulation check to ensure that the recalled sport scenarios were in fact distressing for the athlete at the time that they occurred. This single item measure has been used in past research with athletes and has demonstrated that the scenarios that athletes recalled were distressing (Ferguson et al., 2015; Reis et al., 2015).

Image Quality. Athletes rated the extent to which the image that they generated during the stress induction was easy to generate, arousing, clear, meaningful, emotional, and useful (6-items) on a scale from 1 (“Not at all easy to form”) to 7 (“Very easy to form”). See Appendix H for this scale. A mean score was computed from six items in order to assess athletes' overall image quality. High scores indicated high image quality. This served as a manipulation check to ensure that the stress induction was effective, and that athletes were in fact imagining what we asked them to. This measure was developed based on recommendations from imagery researchers (see Gregg & Hall, 2006; Hammond et al., 2012; Lang, 1979).

Outcome Variables (Measured during lab session).

Behavioral and Psychological Responses to Failure Scenarios. Participants behavioral reactions, thoughts and emotions in response to their recalled failure scenario were assessed in order to reflect athletes' psychological reactivity in response to their sport failure. While there

are no psychometric properties for these measures, they have been used in studies by Leary et al (2007) in a university student sample, and by Reis et al (2015) in a study with athletes.

Behavioural reactions. Using a scale ranging from 1 (“not at all”) to 6 (“extremely”), participants were asked to rate the degree to which they reacted in each of nine ways (e.g., “I was really hard on myself”) at the time of the sport failure they were asked to recall. All individual reaction items were analyzed, as per Leary et al. 2007 and Reis et al. 2015. These items are outlined in Appendix I.

Thoughts. Participants were asked to rate the extent to which each of the six thoughts about the scenario were relevant for them (e.g., “This isn’t any worse than what other people go through”), on a scale ranging from 1 (“I did not think this thought at all”) to 5 (“I kept thinking about this thought”). Again, all individual thought items were analyzed (see Leary et al., 2007; Reis et al., 2015). These items are outlined in Appendix J.

Emotions. To assess emotional responses to the failure scenario, participants were asked to rate the extent to which they felt a series of emotions on a scale from 1 (“not at all”) to 6 (“extremely”), at the time that the recalled scenario took place. The 16 terms were divided into four subscales pertaining to sad (4 items: sad, dejected, down, depressed), anxious (4 items: nervous, worried, anxious, fearful), angry (4 items: irritated, angry, hostile, mad), and self-conscious emotions (4 items: embarrassed, humiliated, guilty, ashamed). Means of the individual terms within each of the four subscales (i.e., sadness, anxiety, anger and self-conscious emotions) were summed to create subscale scores, (Leary et al, 2007; Reis et al., 2015). Other researchers have used this scale in studies with university students (Leary et al., 2007) and student athletes (Reis et al., 2015). The emotion items are outlined in Appendix K.

Physiological Reactivity. Physiological recordings from the (i) baseline and (ii) stress induction phases were used to determine participant's physiological reactivity scores. Reactivity was assessed by converting participants' mean reactivity values for each physiological marker into a ratio score that examined changes in physiological markers (reactivity) relative to their individual baseline values (stress/baseline; Rockliff et al., 2008). Each physiological parameter was assessed individually in order to determine participants' physiological reactivity.

Physiological Recovery. Physiological recordings from (i) the baseline and (ii) the recovery phases were used to determine the participant's physiological recovery score for each physiological parameter of interest (HRV, skin conductance, rate of respiration, heart rate, EMG (L and R), and temperature). Mean values for each physiological parameter were converted into a ratio score (recovery/baseline). Doing so allowed me to assess participants' ability to recover each physiological parameter relative to their individual baseline scores (mean recovery/mean baseline; Rockliff et al., 2008; V.E. Wilson & Somers, 2011). These ratios were calculated for each physiological parameter of interest and analyzed individually.

Procedures

Recruitment. Upon attaining ethical approval, participants were recruited through in-person requests to teams, posters (shared with coaches; displayed in team facilities), and word of mouth at two universities in Winnipeg and the local Sport Centre. Posters were also displayed in various other centers for athletes (i.e., team rooms, the athletic therapy centre, and dressing rooms). Athletes were informed that by participating in this research study, they would learn more about their body's natural responses to stress and the information may provide insights for performance enhancement and arousal management. This information was included in all recruitment materials.

Eligibility Screening and Baseline Questionnaires. Interested athletes were instructed to contact the researcher directly. The researcher forwarded to the participants a link to the study website that provided them with information about the study and the eligibility questionnaire. If participants were ineligible, the researcher informed them that they were unfortunately ineligible to participate, thanked them for their time, and invited any questions or concerns that the athlete may have had. If deemed eligible for the study, the researcher sent participants the link to the study website and asked them to review the informed consent form, indicate their consent to participate, and after providing informed consent, complete baseline measures (i.e., demographic questionnaire, Self-Compassion Scale, Fear of Self-Compassion Scale, and the Rosenberg Self-Esteem Scale). These questionnaires were completed online prior to the lab session in order to minimize the time and energy required of athletes during the lab-based session. Upon completing the questionnaires, participants were thanked for their time and informed that the researcher would contact them within 24 hours to schedule the lab session.

Lab Session. Eligible participants arranged a time to meet the researcher for the lab session. The laboratories were located at the Active Living Centre at the University of Manitoba and at the RecPlex at the University of Winnipeg. When participants arrived at the lab, the researcher explained how the physiological recording equipment worked and addressed any questions participants had. The researcher conducted the physiological testing sessions with participants. She has completed a 36-hour bio neurofeedback training course (ADD Centre Toronto) and has completed supervised practice with bio-neurofeedback training with a clinical psychologist familiar with the equipment. The researcher connected the participants to several sensors and electrodes that assessed physiological responses and instantaneously recorded the data onto the laptop computer screen. Skin conductance response was measured using a sensor

secured on the palmer surface, at the base of the second and fourth proximal phalanges on the participant's non-dominant hand. EMG was measured using a Myoscan Pro sensor (bandpass filter set between 100 and 200 Hz., at a sampling rate of 256 samples per second), placed on the participant's upper trapezii (Combatalade, 2010). Heart rate was measured by attaching a photo-plethysmograph sensor to the palmer surface of the non-dominant thumb (sampling rate of 2048 samples/second; Combatalade, 2010). Skin temperature was assessed by securing a thermal sensor to the palmer surface of the participant's non-dominant digitus medius. Rate of respiration was measured through a respiration belt fastened around the lower abdomen containing a strain gauge that stretches and contracts with inhalations and exhalations. Heart rate variability was assessed based on input from the photo-plethysmograph sensor on the palmer surface of the non-dominant thumb and the respiration belt around the lower abdomen (Combatalade, 2010; Shaw et al., 2012). These variables were assessed prior to stress induction (baseline assessment), during stress induction (reactivity) and following the induction (recovery).

After connecting the participant to the appropriate sensors, the participant sat in a chair facing a computer monitor. The researcher confirmed that the equipment was recording properly and helped the participant to relax by instructing him or her to remain calm and release the tension from their muscles (Rockliff et al., 2008). The researcher allowed two minutes for the participants to acclimate and settle into having the equipment on and to ensure that the equipment was recording properly. At this time, baseline recording of physiological data began. Baseline data consisted of physiological measurements during a two-minute time frame. Participants were instructed to remain calm and relaxed for two minutes. Once baseline data was obtained, the participant was asked to reflect upon a recent failure scenario with their eyes closed, for two minutes. The researcher read an imagery script for approximately two minutes

that lead participants through an imagery exercise that prompted athletes to imagine their recalled failure experience. After imagining the failure scenario, they were given two minutes of recovery time, where they were instructed to relax their body and their mind with their eyes open. Physiological recordings continued during the failure exposure and through to the completion of the recovery phase.

Once the physiological assessment was complete, the researcher disconnected the participants from the biofeedback equipment and participants completed the following questionnaires: imagery quality, behavioural reactions, thoughts and emotions pertaining to their recalled failure scenario, and the degree of emotional distress that the recalled failure scenario had on them at the time that it occurred. Upon completing questionnaires, the researcher provided participants with a debriefing letter that outlined the study objectives and asked them to indicate if they would like a summary of the study results sent to them. Participants also had the option to review their individual results with the researcher at this time. Upon completing these steps, the participant's involvement was complete, and the researcher thanked the participant for their time.

Analytical plan

Statistical Analyses. To test my first research question, I employed two separate hierarchical regression analyses to determine if athlete's level of SC is related to their physiological reactivity and recovery when recalling a past sport failure, beyond self-esteem.

1. Does SC relate to athletes' physiological reactivity and recovery?

In two separate series of hierarchical regression analyses, I entered the covariate X1 (Self-esteem) in first (Step 1), followed the main predictor variable M1 (self-compassion)

(Step 2). Physiological reactivity; individual items (7; Y1; first regression) and physiological recovery (7; Y2; second regression) served as the dependent variables.

To address my second research question, I employed a series of separate hierarchical regression analyses to determine if athletes' level of SC was related to their behavioural and psychological reactions to the recalled sport failure (behavioural reactions, thoughts and emotions).

2. Does SC relate to athletes' behavioural reactions to a recalled past sport failure?

In these hierarchical regression analyses, I entered the covariate X1 (self-esteem) first (Step 1), followed by the main variable M1 (self-compassion) (Step 2). Behavioural reactions (Y3) served as the outcome variables. I repeated this analysis for each of the nine behavioral reaction items.

3. Does SC relate to athletes' thoughts about a recalled past sport failure?

In these hierarchical regression analyses, I entered the covariate X1 (self-esteem) first (Step 1), followed by the main variable M1 (self-compassion) (Step 2). Next, I entered the outcome variable Y4 (thoughts). I repeated this process for each of the six thought items.

4. Does SC relate to athletes' emotions about a recalled past sport failure?

In this hierarchical regression analyses, I entered the covariate X1 (self-esteem) first (Step 1), followed by the main variable M1 (self-compassion) (Step 2). Then, I entered the outcome variable Y5 (emotions).

Finally, to assess my third research question, whether fear of self-compassion predicts any unique variance in physiological reactivity and recovery and psychological reactivity beyond SC, I employed a series hierarchical regression analyses.

5. Does fear of self-compassion predict unique variance, beyond SC, in athletes' physiological reactivity and recovery, and psychological reactivity from a recalled past sport failure?

In order to answer this question, I entered the covariate X1 (self-esteem) in the first block. Next, I entered the predictor variable M1 (self-compassion) into to second block. Finally, I entered the predictor variable M2 (fear of self-compassion) into the third block. These analytical steps were applied relative to all outcomes identified in the analyses above in order to determine if fear of self-compassion accounts for more variance beyond SC for all outcomes.

Chapter III

Results

Data Management

Upon reaching the number of participants required to meet the power needs of this project, I followed recommendations from Pallant (2010) and Tabachnick and Fidell (2007) to clean and prepare the data. I reverse-scored negatively worded items, created composite scores, and checked for correctness. I ran a missing value analysis and determined that no variables had less than 5% missing data. Given that less than 5% of the data was missing, Tabachnick and Fidell suggest that any form of dealing with missing data is appropriate (2007). In this case, I used mean substitution to replace missing data. Specifically, for missing items on a particular scale, I used other items from the same scale to determine a mean score and inserted that value. For entire missing scales, I substituted the sample mean. Next, I assessed the data for outliers by converting standardized values to z-scores. Z-score values beyond +/- 3.29 were identified as

outliers (Tabachnick & Fidell, 2007). The original scores of these values were adjusted to one unit larger or smaller than the next most extreme score (Tabachnick & Fidell, 2007). Finally, I assessed the data for violations of normality (skewness and kurtosis; Pallant, 2010). For variables that violated assumptions or skewedness and kurtosis, square root and log functions were performed in order to bring the values closer to zero. After applying multiple transformations, three physiological variables (EMG-L, EMG-R and temperature) still violated assumptions of normality (skewedness and kurtosis) and showed limited variance throughout the three phases. Past research using these variables suggests that both skin temperature and muscle tension (measured at the trapezius) can show highly variable patterns of responding to stress, may reflect other processes beyond psychological stress, and may require greater lengths of time to produce meaningful changes (Ahmed, Begum, Funk, Xiong, & von Scheele, 2011; Helou, Wang, Ashmore, Rosen, & Abbott, 2013; Herborn et al., 2015; Vinkers et al., 2013). Consideration of these points and the statistical violations these variables displayed in the present data led me to remove them from the final analysis. The final analyses included four physiological variables: respiration rate, heart rate variability, skin conductance, and heart rate.

Description of Participants

Of the 142 people who completed the eligibility screening online, 24 were deemed ineligible leaving 118 eligible participants. Twenty-seven people who were eligible did not complete baseline measures and stopped responding or were unable to arrange a time for the laboratory session. The final sample included in the final analyses consisted of 91 participants who completed the remaining study requirements.

In the final sample, participants' ages ranged from 18 to 40, with the mean age being 21 years ($SD = 3.47$). A summary of participant characteristics can be found in Table 1. Participants

were primarily single (94.4%), Caucasian (76.9%), university students (92%), representing a variety of sports with most athletes representing track and field (20.9%). Fifty eight percent of participants were female. Participants had spent an average of 4.19 years competing at their current level in sport ($SD = 4.15$). The mean number of weekly training hours reported by participants was 15 in the competitive season ($SD = 5.78$), and nine hours in the off-season ($SD = 5.43$).

Descriptive Analyses

Correlations were conducted to examine relationships among the variables included in analyses. The assumption of linearity was not violated. Table 2 shows descriptive statistics and Pearson product moment correlation coefficients for predictor variables. Of the variables included as independent variables or covariates in analyses, self-compassion was negatively associated with fear of self-compassion and self-esteem. Fear of self-compassion was associated with self-esteem.

Descriptive statistics for each physiological parameter during the failure induction (stress/baseline) and during the recovery phase (recovery/baseline) are presented in Tables 3 and 4 respectively. Examination of the correlations between physiological variables from the stress induction relative to baseline values (stress/baseline) showed that heart rate variability and respiration rate were negatively correlated ($r = -.59, p < .01$), and heart rate and skin conductance were positively correlated ($r = .36, p < .01$). These patterns of responding are consistent with an arousal response (Magalhaes et al., 2014; Thayer et al., 2012). However, it was unexpected that change in heart rate would not be correlated with changes in respiration rate and heart rate variability (Thayer et al., 2012).

Examination of physiological variables during the recovery phase relative to baseline (recovery/baseline) showed that only heart rate variability and respiration rate were negatively correlated with each other ($r = -.46, p < .01$). This pattern of responding (an increase in heart rate variability and dampened respiration rate) is consistent with a relaxation response (Porges, 2007). Skin conductance and heart rate were not significantly correlated with any of the physiological variables.

Participants' recalled failure experiences were reported as being "moderately" emotionally difficult ($M = 4.10, SD = 1.31$) on a scale that ranged from 1 ("not at all difficult") to 6 ("extremely difficult"). Repeated measures ANOVA analyses conducted for each physiological parameter of interest revealed that the stress induction produced significant changes in the expected directions in all physiological measures ($p < .001$). Examination of participants' reactivity scores revealed that the stress induction elicited mean increases of 5% in heart rate, 25% in respiration rate, and 10% in skin conductance and a 13% mean decrease in heart rate variability. These changes are slightly less than standardized laboratory stressors (e.g., M change = 5bpm; Forcier et al., 2006) but higher than having participants describe a past shameful scenario (e.g., M change = 1.20 bpm; Petrocchi, Ottaviani, & Couyoumdjian, 2016). Following the stress induction, participants reported that their generated image was easy to form ($M = 5.26, SD = 1.24$), clear ($M = 5.63, SD = 1.17$), emotional ($M = 4.60, SD = .99$) and meaningful ($M = 5.20, SD = 1.10$)¹. Further, participants reported that during the imagery task, they felt the emotions of the image ($M = 4.70, SD = 1.10$) and used the image ($M = 5.25, SD = .96$). Consideration of participants' physiological and self-reported responses suggest that the imagery induction successfully induced a stress response in the expected directions.

Analyses of Potential Covariates

Past research suggests that age and gender may influence physiological responding to stress (Corrales, Torres, Esquivel, Salazar, & Orellana, 2012). Further, imagery ability is often used as a covariate when using imagery inductions, as those with high imagery ability may more readily recall a past experience than those with low imagery ability (Kwekkeboom, 2000). Given that we did not specify specific stipulations for when an athlete's failure occurred, nor did we implement a cut off for how difficult the failure was, it was also possible that the time since athletes' failure and the emotional difficulty of the failure may have impacted outcome variables of interest. Thus, these variables were considered as candidates for inclusion as covariates in the main analyses of physiological parameters. I included these variables as covariates if they were correlated with the outcome variable as per suggestions by Tabachnick & Fidell (2007). To determine if any of these variables were related to outcome variables, I ran Pearson product moment correlations between possible covariates such as age, gender, imagery ability, emotional difficulty and time since failure with outcome variables. These correlational analyses revealed that two possible covariates correlated with outcomes of interest: Both sub-scales of the imagery ability measure were correlated with change in respiration rate during the stress induction (stress/baseline): ease ($r = .28, p < .01$) and emotion ($r = .23, p < .05$). Finally, given the associations between self-esteem and SC, and the past precedent and recommendation to control for self-esteem when assessing SC (Neff, 2003), self-esteem was automatically included as a covariate in all analyses.

Main Analyses

A series of hierarchical linear regression analyses were conducted in order to test the three research questions of interest. (Statistics are reported according to recommendations by J. Pallant, 2010).

1. Does SC relate to athletes' physiological reactivity and recovery?

I hypothesized that self-compassion would be negatively related to physiological reactivity during the failure induction, and positively related to physiological recovery following the failure induction.

Physiological reactivity. Four separate hierarchical regression analyses were conducted in order to assess participants' physiological reactivity when recalling their sport failure, relative to their baseline scores. Outcome variables included ratios (stress/baseline) for respiration rate, heart rate variability, skin conductance and heart rate (Rockliff et al., 2008). For respiration rate, the covariates, imagery ability subscales were entered in Step 1 and accounted for a 8.2% of the variance in the outcome ($F(2,88) = 3.91$, $R\ square = .08$, $p < .05$). The additions of the covariate self-esteem in Step 2, and the main predictor SC in Step 3 did not account for any unique variance in respiration rate reactivity. For the remaining three analyses (heart rate variability, skin conductance, and heart rate), the covariate, self-esteem was entered in Step 1, and, in all analyses, accounted for no significant variance in any of the outcomes of interest. The main predictor, SC, was entered in Step 2. For all four variables, SC accounted for no significant variance. Thus, neither self-esteem or SC accounted for variance in physiological reactivity for any of the parameters of interest.

Physiological recovery. In order to determine if SC impacted the recovery of specific, individual physiological parameters relative to participants' baseline scores, four separate hierarchical regression analyses were conducted. Outcome variables included ratios (recovery/baseline) for respiration rate, heart rate variability, skin conductance and heart rate (Rockliff et al., 2008). For all analyses, the covariate, self-esteem was entered in Step 1, and accounted for no significant variance in the outcomes of interest in any of the analyses. The

independent variable, SC, was entered in Step 2. These new models accounted for no significant portion of the variance in respiration rate, skin conductance or heart rate recovery. However, for the analysis conducted with heart rate variability, the addition of SC in Step 2 accounted for an additional 8.4% variance in this outcome ($F(1, 88) = 8.18$, $R\ square = .10$, $R\ square\ change = .08$, $p < .01$). The size of this effect was small ($f^2 = .11$). Inspection of the beta values revealed that both self-esteem ($beta = .33$, $p = .01$) and SC ($beta = .37$, $p = .01$) accounted for participants' heart rate variability at the recovery phase relative to their baseline heart rate variability, with SC having the strongest association with this outcome, relative to self-esteem. SC did not account for a significant amount of variance in any other indicators of physiological recovery.

2. Does SC relate to athletes' psychological reactivity (i.e., behavioural reactions, thoughts and emotions) to a recalled sport failure?

I hypothesized athletes' levels of SC would be positively associated with adaptive behavioural reactions and negatively associated with maladaptive reactions pertaining to the recalled sport failure. For each outcome of interest, I conducted separate hierarchical regression analyses. For each analysis, I entered the covariate X1 (self-esteem) first (Step 1), the main variable M1 (self-compassion) (Step 2) followed by the relevant outcome variables.

Behavioural reactions. Behavioural reactions served as the outcome variables. I explored whether behavioural reaction items could be combined in order to create a "behavioural equanimity" score. The negatively worded item ("I was really hard on myself"), was reverse scored and combined with the remaining adaptive behavioural reaction items. Past researchers analyzed these items separately (Leary et al., 2007; Reis et al., 2015), however, combining eight of these nine items produced an acceptable reliability statistic ($\alpha = .78$). Thus, adaptive behavioural reactions were combined to form a composite "behavioural equanimity" score. I

analyzed the remaining item (“I expressed my emotions to let off steam”) separately, as this was the only item from the composite scale whose removal increased the reliability of this composite scale. At Step 1, the covariate, self-esteem, was entered and contributed 9.5% of the variance in behavioural equanimity, $F(1, 89) = 9.31$, $R\ square = .10$, $p < .01$). Upon entering the independent variable, SC in Step 2, the total model accounted for 20.9% of the variance in behavioural equanimity, $F(1, 88) = 15.1$, $R\ square = .21$, $R\ square\ change = .13$, $p < .01$. Inspection of beta weights indicated that SC had unique effects on behavioural equanimity such that SC was associated with behavioural equanimity ($beta = .46$, $p < .01$) and the effects of self-esteem were no longer significant ($beta = .03$, $p = .82$). These analyses revealed that SC positively associated with behavioural equanimity, beyond the effects of self-esteem. The ability of SC to account for behavioural equanimity beyond self-esteem was considered to be a medium sized effect ($f^2 = .27$).

For the remaining behavioural reaction item (“I expressed my emotions to let off steam”), at Step 1, the covariate, self-esteem, was entered and did not account for variance in this outcome. Upon entering the independent variable, SC in Step 2, the total model accounted for no significant additional variance in the outcome. Thus, neither self-esteem or SC associated with unique variance in expressing emotions to let off steam in response to a recalled sport failure.

Thoughts. Thought items (6) were assessed individually and entered as the outcome variables in a series of hierarchical linear regression analyses. The covariate self-esteem was entered in Step 1, and did not account for significant variance in the outcome, “I seem to have bigger problems than most people do”. Upon entering the independent variable, SC, in Step 2, SC accounted for an additional 6.0% of the variance in the outcome ($F(1, 88) = 5.84$, $R\ square = .10$, $R\ square\ change = .06$, $p < .05$). The size of this effect was considered to be small ($f^2 = .11$).

Inspection of the beta weights revealed that only SC accounted for unique variance in this outcome and this relationship was negative ($beta = -.31, p = .02$).

For the second item, “my life is really screwed up”, the covariate self-esteem was entered in Step 1. This model accounted for 10% of the variance in outcome ($F(1, 89) = 9.78, R\ square = .10, p < .01$). When the independent variable, SC, was entered in Step 2, this model accounted for 17.0% of the variance in the outcome, $F(1, 88) = 7.47, R\ square = .17, R\ square\ change = .07, p < .01$. The size of this effect was considered to be small ($f^2 = .20$). Further inspection of the beta values revealed that when controlling for self-esteem, only SC negatively associated with this outcome in response to a sport failure ($beta = -.34, p = .01$).

For the third item, “Why do these things always happen to me?”, the covariate self-esteem was entered in Step 1 and did not account for significant variance in this outcome. When the independent variable, SC, was entered in Step 2, the new model accounted for 9.8% of the variance in the outcome ($F(1, 88) = 6.04, R\ square = .10, R\ square\ change = .06, p < .05$). The size of this effect was considered to be small ($f^2 = .11$). Inspection of the beta values showed that only SC was associated with this thought in the model and the relationship was negative ($beta = -.31, p = .02$).

For the fourth item, “Everyone has a bad day”, the covariate, self-esteem, was entered in Step 1 and did not account for significant variance in this outcome. The independent variable, SC, was entered in Step 2 and did not account for any unique variance in the outcome. The new model accounted for 3.5% of the variance in the outcome ($F(1, 88) = 1.92, R\ square = .04, R\ square\ change = .02, p > .05$). Thus, neither self-esteem nor SC accounted for significant variance in this outcome in response to a recalled sport failure.

For the fifth item, “I’m a loser”, when the covariate, self-esteem, was entered in Step 1, self-esteem accounted for 13.2% of the variance in the outcome ($F(1, 89) = 13.51$, $R\ square = .13$, $p < .01$). When SC was entered in Step 2, SC accounted for an additional 10.7% of the variance in the outcome, ($F(1, 88) = 12.36$, $R\ square = .24$, $R\ square\ change = .11$, $p < .01$), and the effects of self-esteem were no longer significant. Thus, SC accounted for unique variance beyond self-esteem in this outcome and the relationship was negative ($beta = -.43$, $p = .00$). The size of this effect was considered to be medium ($f^2 = .32$).

For the final item, “this is no worse than what other people go through”, the covariate self-esteem was entered in Step 1, and did not account for significant variance in the outcome. When SC was entered in Step 2, the new model accounted for 5.1% of the variance in the outcome ($F(1, 88) = 4.04$, $R\ square = .05$, $R\ square\ change = .04$, $p < .05$). The size of this effect was considered to be small ($f^2 = .10$). Thus, only SC was associated with this thought ($beta = .26$, $p = .05$).

Emotions. Four emotion subscales (sad, anxious, angry and self-conscious) were entered separately as the outcome variables in a series of hierarchical regression analyses. For the first subscale, sad emotions, the covariate self-esteem entered in Step 1. Self-esteem accounted for 10.8% of the variance in sad emotions ($F(1, 89) = 10.77$, $R\ square = .11$, $p < .01$). When the independent variable, SC, was entered in Step 2, the total model accounted for 14.3% of the variance in sad emotions ($F(1, 88) = 5.65$, $R\ square = .16$, $R\ square\ change = .05$, $p < .05$). The size of this effect was considered to be small ($f^2 = .20$). Inspection of the beta values showed that only SC emerged as a correlate of the outcomes of sad emotions ($beta = -.29$, $p = .02$) and the association was negative.

For the second subscale, anxious emotions, the covariate self-esteem was entered in Step 1 and accounted for no significant variance in the outcome. When the independent variable, SC, was entered in Step 2, the total model accounted for 8.4% of the variance in anxious emotions ($F(1, 88) = 5.82$, $R\ square = .08$, $R\ square\ change = .06$, $p < .05$). The size of this effect was considered to be small ($f^2 = .10$). Inspection of the beta values revealed that only SC negatively associated with the outcomes of anxious emotions ($beta = -.31$, $p = .02$) and the relationship was negative.

For the third subscale, angry emotions, the covariate self-esteem was entered in Step 1 and accounted for no significant variance in the outcome. When the independent variable, SC was entered in Step 2, the total model accounted for 8.5% of the variance in angry emotions ($F(1, 88) = 6.56$, $R\ square = .09$, $R\ square\ change = .07$, $p < .05$). The size of this effect was considered to be small ($f^2 = .10$). Inspection of the beta values showed that only SC emerged as a correlate of the outcomes of angry emotions, ($beta = -.33$, $p = .01$) and the relationship was negative.

For the final subscale, self-conscious emotions, the covariate, self-esteem was entered at Step 1 and accounted for no significant variance in the outcome. When the independent variable, SC, was entered in Step 2, the total model accounted for 9.7% of the variance in self-conscious emotions ($F(1, 88) = 9.01$, $R\ square = .12$, $R\ square\ change = .09$, $p < .01$). The size of this effect was considered to be small ($f^2 = .14$). Inspection of the beta values revealed that only SC negatively associated with the outcomes, self-conscious emotions ($beta = -.39$, $p = .00$).

3. Does fear of self-compassion account for unique variance in athletes' physiological and psychological reactivity and recovery respectively from a recalled sport failure, beyond SC?

I hypothesized that fear of self-compassion should account for unique variance in markers of physiological reactivity and recovery and psychological recovery, over and above SC. I expected the relationship between fear of self-compassion and psychological and physiological reactivity to be positive, while the association with this variable and physiological recovery would be negative. All analyses outlined above were repeated, and the second predictor, fear of self-compassion, was entered in Step 3.

Physiological reactivity. For all outcomes of interest, the new model that included the addition of the second predictor, fear of self-compassion, did not account for any unique variance in physiological reactivity for each parameter of interest. Thus, fear of self-compassion did not account for any unique variance in physiological reactivity over and above self-esteem and SC.

Physiological recovery. For all outcomes of interest, the new model that included the addition of the second predictor, fear of self-compassion, did not account for any unique variance in physiological recovery for any of the parameters of interest. Thus, fear of self-compassion did not account for any unique variance in physiological recovery, over and above self-esteem and SC.

Behavioural reactions. The new model that included the addition of fear of self-compassion in Step 3, did not account for any unique variance in the outcome, behavioural equanimity, beyond self-esteem and SC. However, inspection of the beta values indicated that fear of self-compassion was negatively associated with behavioral equanimity and approached the conventional level of significance ($beta = -.19, p = .09$). The same analysis was repeated for the additional item “I expressed my emotions to let off steam”. Results showed that fear of self-compassion did not account for any unique variance in this outcome, beyond self-esteem and SC. However, inspection of the beta values revealed that when controlling for self-esteem and SC,

the association between fear of self-compassion and the outcome approached the conventional level of significance ($beta = .22, p = .08$).

Thoughts. The addition of the second predictor, fear of self-compassion, in Step 3 accounted for unique variance in one of the six thought items, when controlling for self-esteem and self-compassion. For the thought item “Everyone has a bad day now and then”, the model that included fear of self-compassion accounted for an additional 4.7% of the variance in the outcome beyond self-esteem and SC ($F(1, 87) = 4.45, R\ square = .08, R\ square\ change = .05, p < .05$). The size of this effect was small ($f^2 = .10$). Inspection of the beta values showed that fear of self-compassion was negatively associated with this outcome ($beta = -.26, p = .04$), and exerted the opposite effect of SC ($beta = .11, p = .42$). Further, the model that included fear of self-compassion in Step 3 approached the conventional level of significance for the thought item “In comparison to other people, my life is really screwed up” ($F(1, 87) = 3.10, R\ square = .20, R\ square\ change = .03, beta = .20, p = .08$), and exerted the opposite effect from SC ($beta = -.28, p = .03$). The addition of fear of self-compassion into the model in Step 3 did not account for unique variance in the remaining five thought items.

Emotions. The addition of the second predictor, fear of self-compassion in Step 3 did not account for unique variance in emotion subscales, beyond SC and self-esteem. Thus, fear of self-compassion did not significantly account for any unique variance in negative emotions when controlling for self-esteem and SC.

Chapter IV

Discussion

The purpose of this study was to examine the influence of SC on athletes’ physiological and psychological responses to a recalled sport failure, and further, to determine if fear of self-

compassion accounted for any unique variance in these outcomes. SC did not associate with athletes' physiological reactivity when recalling a past sport failure. SC did relate to an aspect of physiological recovery; athletes higher in SC had higher heart rate variability, an indicator of emotional regulation (Thayer et al., 2012) during the recovery phase. While there is some evidence that SC promotes adaptive physiological responding to stress (Arch et al., 2014; Breines et al., 2015), this is the first study to explore this relationship in athletes, for whom physiological recovery is central for performance and health (Dupee et al., 2016; Thayer & Sternberg, 2006). SC also associated with adaptive psychological reactions to athletes' recalled sport failures. In general, athletes who were self-compassionate acted, thought and felt more adaptively relative to their recalled sport failure compared to those lower in SC. These findings are consistent with past research, also with athletes, and suggest that SC is a valuable resource to athletes when they are coping with sport failures or setbacks. Finally, fear of self-compassion did not account for any unique variance in physiological responses beyond self-compassion, but accounted for some unique variance in maladaptive thoughts and behaviours, above SC. For these outcomes, fear of self-compassion operated distinctly from SC (in the opposite direction), which supports the potentially maladaptive effects of fear of self-compassion on psychological well-being and the notion that SC and fear of self-compassion are not merely opposites. Given the dearth of research that has examined fear of self-compassion and SC concurrently, this is a unique contribution to the literature.

Self-Compassion and Physiological Reactivity

SC did not relate to athletes' physiological reactivity when recalling a past performance failure. This finding was surprising given past research which suggests that SC can dampen physiological reactivity during stress (Arch et al., 2014) and soothe the affect system (Gilbert,

2014; Rockcliff et al., 2008). However, there are complexities that can impact physiological responding to stress that may have impacted the present results. Indeed, the stress response is complex and additional factors (e.g., coping strategies, chronic stress) can impact one's physiological expression of stress (Ahmed et al., 2011; Katz, 2007). For instance, experiencing chronic stress and maladaptive coping can lead to a temporary increase in heart rate variability during stress (Katz, 2007), as opposed to the expected decrease (Porges, 2007; Thayer & Lane, 2000). Responding in this way is taxing to the body's systems and reflects dysregulation of the autonomic nervous system (Porges, 2007; Thayer et al., 2012). Relatedly, maladaptive coping strategies, such as avoidance of negative emotions or emotional suppression, may present as a decrease or levelling off of skin conductance during a stressor, rather than the expected increase in skin conductance (Dindo & Fowles, 2011; Hansen et al., 2008; Shepherd & Wild, 2014). Physical fitness levels may also have impacted physiological reactivity to stress, as fit individuals have demonstrated dampened heart rate reactivity during laboratory stressors in past research (Forcier et al., 2006). Given the athletic nature of my sample, it is possible that physical fitness may have impacted heart rate reactivity, beyond SC. Consideration of these points suggests that there may be factors in addition to SC that impacted participants' responding during the stress induction that created noise within the reactivity analysis. This makes it difficult to distinguish the effects of SC from other potential influences. Future studies should examine and control for other emotional and coping processes, and physical fitness that may impact physiological responding during a stress induction.

Another possible explanation for the lack of relationship between SC and physiological reactivity is that SC may *not* dampen participants' physiological responding to stress, as hypothesized but rather open them up to the experience of stress. Eliciting a context appropriate

physiological stress response is adaptive and reflects a functioning system (Porges, 2007). Therefore, self-compassionate athletes may have been willing to allow themselves to re-experience this negative event, and thus, showed the expected stress response. That is, taking a self-compassionate perspective may allow individuals to be mindfully aware and open to the experience of difficult emotions and thoughts, rather than avoiding or disconnecting from them. Further, SC may promote a recognition that feeling inadequate is a part of the human experience, rather than feeling isolated and ashamed of these experiences (Neff et al., 2005; Neff et al., 2007). SC has been linked to adaptive coping in the face of negative events such as positive cognitive reappraisal, the ability to tolerate negative emotions, and acceptance (Allen & Leary, 2010, Diedrich et al., 2014; Diedrich et al., 2016; Leary et al., 2007), and was negatively associated with maladaptive emotional regulation such as avoidance, thought suppression and rumination (Barnard & Curry, 2011; Neff et al., 2005; Neff et al., 2007; Raes, 2010). In line with self-reported reactions to stress, Arch and colleagues (2014) found that SC did not relate to participants' heart rate variability *during* a stressor (reactivity) but related to higher heart rate variability following the stressor (recovery). Thus, SC may promote engagement with difficult experiences and stress, and allow for adaptive psychological and physiological responding. Further, it may be the recovery phase where SC becomes especially critical for psychological and physiological processes.

Self-Compassion and Physiological Recovery

SC was related to one aspect of physiological recovery, high heart rate variability, but not other physiological indicators (heart rate, respiration rate or skin conductance), during the recovery phase following the stress induction. This finding is consistent with other research demonstrating that heart rate variability is distinctly influenced by the experience of compassion

even when compared to other positive reactions (Stellar et al., 2015). Heart rate variability is also associated with responses that reflect SC such as adaptive cognitive processing, emotional regulation and behavioural responses to changing environmental demands (Thayer et al., 2012; Thayer, Hansen, Saus-Rose, & Johnsen, 2009) even among athletes (Laborde, Brull, Weber, & Anders, 2011). Though other studies showed that individuals with high (Breines et al., 2015) or increased levels of SC (Arch et al., 2014) showed high heart rate variability during recovery from a laboratory stressor, my study is the first to show this relationship among athletes recalling a sport failure. The findings suggest that SC may offer a recovery resource to athletes, in the form of the control of heart rate variability. Given the link between SC and heart-rate variability and its correlates, it makes sense that SC may impact heart rate variability following a stressor more so than other physiological parameters (e.g., skin conductance, heart rate or respiration rate), which may be influenced to a greater extent, by other factors (Dindo & Fowles, 2011; Forcier et al., 2006; Guerreiro, Rita, & Trigueiros, 2015; Hansen et al., 2008; Shepherd & Wild, 2014).

The finding that self-compassionate athletes showed high heart rate variability after reflecting about a personal sport failure provides objective support for the self-reported findings that SC helps athletes respond adaptively to setbacks and stay mentally well in the face of failures (Ferguson et al., 2014; Mosewich et al., 2013; Reis et al., 2015). Indeed, emotional and behavioural outcomes associated with high heart rate variability (i.e., emotional regulation and behavioural flexibility; Porges, 2007; Svendsen et al., 2016; Thayer et al., 2012) are consistent with SC's relationship with accurate self-perceptions, emotional regulation, acceptance, personal responsibility and motivation to improve (Breines & Chen, 2012; Diedrich et al., 2016; Leary et al., 2007; Zhang & Chen, 2015). Moreover, findings from an fMRI study demonstrated that

being self-compassionate may elicit physiological changes that facilitate effective emotional processing and control in response to stress: Individuals with more self-reassuring tendencies (similar to SC), showed greater activation in brain areas associated with emotional regulation and self-regulatory control after being asked to imagine situations involving personal failures or rejection, compared to those who were more self-critical (Longe et al., 2010). It is possible that the emotional safety that SC provides allows athletes to effectively face and process negative emotions, calm the body's stress responses, and remain emotionally and cognitively flexible (Neff, 2003; Svendsen et al., 2016), as opposed to ruminating, obsessing or denying these difficult emotions, or avoiding these scenarios or emotions, which can sustain or dysregulate physiological arousal (Gilbert, 2014; Porges, 2007; Shepherd & Wild, 2014).

The regulation of heart rate variability has implications for well-being (Porges, 2007; Thayer et al., 2012), health (Thayer & Sternberg, 2006) and performance (Wawrzyniak et al., 2016; Williams et al., 2016). Thus, SC's association with physiological recovery is significant given that sustained instances of low or dysregulated heart rate variability are predictive of behavioural (inhibition and risk aversion; Porges, 2007; Thayer et al., 2012) and psychological (negativity bias and poor emotional regulation; Thayer & Lane, 2009; Thayer et al., 2012) risk factors for psychopathology and adverse health (e.g., glucose dysregulation, inflammation and disrupted hypothalamic-pituitary axis function; Juster et al., 2010; Thayer & Lane, 2009; Thayer & Sternberg, 2006; Thayer et al., 2012).

In addition to predicting health and behavioural outcomes, heart rate variability may also have implications for performance. Some research suggests that low heart rate variability is associated with slow reaction time and variability in responding (less accuracy; Williams et al., 2016) and slow reaction time following a stressor (Wawrzyniak et al., 2016). Given the

degenerative effects of low heart rate variability on performance (Wawrzyniak et al., 2016; Williams et al., 2016), adopting SC should help to facilitate optimal performance states for athletes when they encounter performance stressors, given its association with high heart rate variability (Arch et al., 2014).

My results revealed that SC did not associate with physiological recovery of skin conductance, heart rate or respiration rate. Aforementioned reasons that can complicate the expression of stress reactivity (e.g., emotional suppression, avoidance, under-arousal, chronic stress, and physical fitness) can also impact recovery (e.g., a decrease in skin conductance thought to be adaptive can be maladaptive; effective heart rate recovery in fit individuals; Dindo & Fowles, 2011; Forcier et al., 2006; Hansen et al., 2008; Shepherd & Wild, 2014). These reasons also offer an explanation for why SC may not have related to several physiological indicators in this study.

An additional possibility to explain the null findings in reactivity on several physiological indicators could be that these measures may not effectively distinguish positive from negative emotions. For instance, increases in skin conductance and heart rate are associated with both negative (stress) and positive (excitement, pride) arousal states (Gilbert, 2014; Guerreiro et al., 2015; Stellar et al., 2015). Though I did not measure positive affect relative to athletes' recalled failure experience, it is possible that after reflecting about these scenarios, athletes – especially self-compassionate athletes, may have felt emotions such as pride, self-assurance, gratitude, and contentment. Indeed, taking a self-compassionate perspective towards negative events may allow for effective processing of difficult experiences (Gilbert, 2010; Odou & Brinker, 2015) and promote feelings of agency and hope and promote positive affect following a stressful experience (Odou & Brinker, 2015; Zhang & Chen, 2016). Thus, additional factors not assessed

in this study may have impacted some of the physiological indicators and created additional noise in these analyses.

Self-Compassion and Psychological Reactions

SC was associated with adaptive psychological reactions to a past performance failure or setback. Relative to the failure or setback, athletes higher in SC showed greater behavioural equanimity and adaptive thoughts, and lower negative affect compared to those lower in SC. Neff (2003) argues that being self-compassionate allows for a balanced awareness of difficult emotions, a desire to soothe the self through hard times and connect to others in the process. This perspective allows for the recognition of painful emotions, prevents negative affect, rumination or over-identification with personal failures, and fosters motivation to think and behave in ways that sustain well-being (Allen & Leary, 2010; Barnard & Curry, 2011; Neff, 2003; Terry & Leary, 2011). These arguments are consistent with my findings and other's with athletes (Ferguson et al., 2015; Reis et al., 2015) and general samples (Arimitsu & Hoffman, 2015; Leary et al., 2007) who have shown that being self-compassionate reduces negative affect and promotes equanimous thoughts and actions.

It should be noted that only a small number of studies have examined associations between SC and psychological well-being among athletes (Ferguson et al., 2014; Huysmans & Clement, 2017; Mosewich et al., 2011; Mosewich et al., 2013) and only two studies have examined this relationship in response to recalled and hypothetical setbacks (Ferguson et al., 2015; Reis et al., 2015). Reis and colleagues (2015) found that SC was associated with equanimous behaviour, low negative affect and adaptive thoughts in response to hypothetical and recalled sport failures. My results complement and enhance these findings by further demonstrating the protective role of SC on athletes' psychological well-being in response to

setbacks and extending these findings to males. Further, Ferguson and colleagues (2015) explored possible mechanisms through which SC may promote psychological well-being and self-acceptance in response to challenging hypothetical sport scenarios. Results revealed that the relationship between SC and self-acceptance in response to difficult sport scenarios was mediated by positive, perseverant, and responsible reactions and negatively related to ruminative and passive reactions (Ferguson et al., 2015). Again, this points to the ability of SC to keep athletes mentally well in the face of setbacks and promote adaptive reactions in times of suffering. My results complement this study by assessing athletes' psychological and physiological responses to personally relevant failure experiences.

My study enhances the existing literature about SC and athletes by being the first study to include male athletes within the sample. A recent review showed that differences in SC between males and females are small, with males showing slightly higher levels of SC compared to women (Yarnell et al., 2015). While this finding suggests that men relate to their struggles with SC more so than women, there are reasons that men and male athletes stand to benefit from SC. Specifically, male athletes show similar instances of mental health concerns (e.g., anxiety, mood and eating disorders) and higher rates of substance abuse and addictive behaviour (Reardon & Factor, 2010) as women athletes. An additional challenge to protecting male athlete's mental health can stem from their tendencies to adhere to traditionally masculine ideals that emphasize achievement, dominance, aggression, and internalization of difficult emotions (Levant, 2011), which is associated with increased vulnerability to psychological distress and psychopathology in general (Levant, 2011; Reilly, Rochlen, & Awad, 2014) and in sport (Miller & Hoffman, 2009). Given the psychological resilience and coping advantages associated with SC (MacBeth & Gumley, 2012, Arimitsu, & Hofmann, 2015), SC should be relevant and useful for men as

well as women. Another unique aspect of my study sample is the focus on exclusively competitive athletes. While other studies have examined SC among general sample of female athletes (e.g., non-competitive), this study included only competitive (national or university-level) athletes, for whom failures are salient, emotionally distressing, and impactful (Davis et al., 2007; Hammond et al., 2013; Reardon & Factor, 2010). Findings from my study, along with the few other studies conducted in sport, point to the usefulness of SC for athletes. It is important to continue to demonstrate the robustness of these effects, given that failure and setbacks are commonplace in sport and impact athletes' mental and physical health (Davis et al., 2007; Powers et al., 2009; Sutherland et al., 2014).

Results from my study suggest that SC was associated with adaptive psychological reactions to sport failure, beyond the effects of self-esteem. My results are consistent with others' who have also found that SC associates with adaptive psychological outcomes in the face of setbacks over and above self-esteem in sport (Mosewich et al., 2011), exercise (Semenchuk, Strachan & Fortier, 2018), and within general contexts (Breines & Chen, 2012; Leary et al., 2007). This finding is consistent with the perspective offered by Neff (2003b) that while SC and self-esteem are related constructs, the experience of SC should be distinct and superior to that of high self-esteem. Maintaining high self-esteem can be problematic as it relies on meeting performance standards and seeing oneself as superior to others (Neff, 2003b). On the other hand, SC allows individuals to turn negative feelings of inadequacy associated with failing into positive experiences of kindness and understanding, and accept responsibility without dismissal, blame or judgement (Neff, 2003b; Neff & Vonk, 2009). Thus, SC may be a more useful approach for athletes than self-esteem when dealing with failure. A surprising but important finding to note from this study was that for some variables (e.g., thinking "I'm a loser", "my life

is really screwed up” and “I have bigger problems than most people do”), SC and self-esteem had opposite effects; self-esteem was positively associated while SC was negatively associated with these maladaptive thoughts. In accordance with Neff’s (2003b) arguments, these findings suggest that SC may be more adaptive than self-esteem when encountering personal failures. Further, while self-esteem is associated with positive outcomes (e.g., happiness, optimism and positive affect; Neff, 2003b, Neff, 2009; Neff et al., 2007) research increasingly links it with drawbacks (e.g., narcissism, negative affect, displacing responsibility; Leary et al., 2007; Neff & Vonk, 2009). In addition to self-esteem, developing SC in sport should continue to be a focus for researchers and practitioners as a way to equip athletes to deal with the difficult experiences associated with sport.

Fear of Self-Compassion

Despite the benefits associated with SC, athletes are hesitant to adopt this approach (Ferguson et al., 2014; Sutherland et al., 2015), which the present and other (Ferguson et al., 2015, Mosewich et al., 2013; Reis et al., 2015) results suggest may help to reduce psychological distress. The athletes in my sample were generally low in fear of self-compassion ($M = 17.91$; possible maximum score = 60), and were slightly more fearful of self-compassion than another sample of athletes ($M = 15.18$; Ferguson et al., 2015), but were less so than a sample of highly critical, eating disorder patients ($M = 31.15$; Kelly et al., 2013). Only one other study to my knowledge has concurrently examined SC and fear of self-compassion among athletes (Ferguson et al., 2015). However, this study did not assess the unique contribution of fear of self-compassion beyond SC on the outcomes of interest. Thus, a unique contribution of my work is the examination of whether fear of self-compassion contributes unique variance in athletes’ reactions to sport failures beyond SC.

Fear of self-compassion did not account for any unique variance in physiological responding to or recovery from a stress induction. Participants were not asked to reflect about or relate to the situation in a compassionate manner. Given that fear of self-compassion seems to involve an active resistance to extending compassion towards the self (Gilbert et al., 2011), it may be that fear of self-compassion's relationship with physiological responses is more apparent when the opportunity to be self-compassionate is made salient. This was the case in a study by Rockliff and colleagues (2008) who found that highly self-critical individuals (who may be fearful of SC; Gilbert et al., 2011, Kelly et al., 2013) actually showed patterns of responding consistent with a threat-defense response (lower heart rate variability and increased cortisol) when asked to engage in compassion-focused imagery. Therefore, fear of SC may be more relevant in an intervention or experimental induction where athletes are taught or urged to put SC in place in response to a failure.

Fear of self-compassion did not account for additional variance in negative emotions beyond SC but did account for unique variance in some maladaptive thoughts and behavioural reactions (e.g., thinking "everyone has a bad day now and then" and approached significance for the thought "In comparison to other people, my life is really screwed up", behavioural equanimity, and the behavioural item "I expressed my emotions to let off steam"). Moreover, the effects of fear of self-compassion were opposite to those of SC. My findings demonstrate that resisting compassionate thoughts and feelings toward oneself can have destructive effects on well-being and behaviour. This is consistent with other findings among athletes who found that fear of self-compassion associated with destructive (i.e., ruminative, passive and self-critical) reactions to a hypothetical setback (Ferguson et al., 2015) and that highly self-critical athletes showed impaired goal progress and well-being when they encountered setbacks (Powers et al.,

2009). These results challenge athletes' assertions that self-criticism is necessary for growth and improvement in sport (Ferguson et al., 2014; Rodriguez & Ebbeck, 2015). Thus, athletes who resist offering themselves compassion may be missing out on optimized recovery and well-being. Moreover, given that this is the first study to show that fear of self-compassion accounted for unique variance in some psychological outcomes beyond SC among athletes, interventions conducted in sport should aim to foster SC but also to reduce fear of self-compassion, as both constructs can impact athletes' well-being.

Strengths

There are a number of strengths of this study. First, I am the first researcher that I know of to look at the relationship between SC and *physiological* responses to a recalled sport failure or setback. I found physiological support, in the case of heart-rate variability, to complement existing self-reported findings that SC promotes adaptive emotional regulation and psychological reactivity to failure and stress. This is promising given that individual's stress responses may be consistent and replicable across contexts and stimuli (Andreassi, 2007). Further, Forcier et al. (2006) argue that the most rapid recovery from stress occurs immediately following exposure to stress (within the first several minutes). Thus, the immediacy of the recovery measure and time window of two minutes is a strength in terms of capturing immediate recovery responses. The fact that SC emerged as a distinguishing factor for an aspect of athletes' recovery (heart rate variability) during this time is promising. This timeframe is also consistent with what happens in many sport contexts, where athletes are required to rapidly recover from failures. Thus, being able to regulate heart rate variability in a short period of time poses performance advantages. Findings from this study address recommendations from past researchers who called for the use of personally relevant, recalled scenarios when assessing athletes' thoughts, feelings and

behaviours (Ferguson et al., 2014; Reis et al., 2015). Indeed, I required competitive athletes to reflect about a personal, recent and highly distressing failure that occurred in their sport (vs. a hypothetical scenario). Another strength relates to my choice to consult with a sports imagery expert in order to ensure that my induction involved imagery best practice. This ensured that I used sound and effective imagery techniques in order to maximize athletes' responses (e.g., prompting athletes to remember emotions, physiological sensations and environmental cues and assessing image quality according to clarity, ease, meaning, and emotional salience; Gregg & Hall, 2006; Hammond et al., 2012; Lang, 1979). As such, I demonstrated that visualising a past performance failure can induce meaningful changes in a physiological parameter. Further, my sample included elite, highly invested athletes, as opposed to recreational athletes; failures and setbacks would be highly distressing to the former group. This study was also the first to my knowledge to include male athletes. Though I did not explicitly examine gender differences, my results demonstrated that SC is relevant in sport for all genders.

Limitations

Several limitations of this study should be considered. First, physiological measurements relied on recalled stimuli to induce stress rather than an immediate stimulus (e.g., a novel laboratory stressor or a real-life failure situation). The use of recalled scenarios ensures that failure experiences are personally relevant and emotionally arousing (Hackman & Holmes, 2004) and are more practical to assess than failures happening in real time. However, the emotional experience that was elicited by this response may have been dampened over time (Breines et al., 2015). In the future, researchers should examine whether SC associates with adaptive physiological responding to standardized laboratory stressors or, seek out practical ways of assessing response to more recent failures than assessed presently. Additionally, the failure of SC

to account for physiological reactivity may also be due to the measures used to assess this response (respiration rate, heart rate, heart rate variability and skin conductance). These physiological markers have demonstrated notable changes in response to repeated, laboratory stressors in other studies (Arch et al., 2014; Dupee et al., 2015; Forcier et al., 2006; Shaw et al., 2012) but none used failure recall as a method of inducing a stress response nor did they assess SC. There may be other, more sensitive measures to assess stress reactivity relative to SC. SC has predicted differences in stress responding to a laboratory stressor when salivary biomarkers associated with sympathetic nervous system activity were used (salivary alpha amylase; Arch et al., 2014; Breines et al., 2015). Thus, other indicators of physiological reactivity should be considered in future research, before concluding the SC does not impact physiological reactivity. Finally, although there are theoretical connections between heart rate variability, SC and performance, I did not measure performance. As such, the relationship between SC and performance is still unclear. This would be an important direction for future research. Finally, given the cross-sectional nature of my data, it is impossible to infer causality.

Future Directions

My study added to past findings that SC promotes adaptive psychological reactions to sport failures and setbacks and provided initial evidence that SC may promote adaptive physiological responding, in terms of heart rate variability, to these setbacks or failures. Given the dearth of studies on SC among athletes, researchers should continue this line of investigation and include prospective and experimental research designs. For example, researchers could induce SC states or train some athletes in SC and compare the effects of this induction/training on responses to failure. In addition to some future research directions I have already outlined, researchers should examine the mechanisms of some of the relationships that have been

established. For example, Ferguson et al. (2015) demonstrated that the relationships between SC and psychological well-being among female athletes was mediated by meaning, body appreciation and autonomy. They also found that this relationship was mediated by high positive and perseverant and low ruminative and passive reactions to hypothetical challenging sport scenarios (Ferguson et al., 2015). These mediators and other mediators should be explored in future research. Finally, given the persistent reliance of self-criticism in sport, it will be important to determine whether modifying athletes' levels of SC, and possibly their fear of self-compassion, impacts their ability to physiologically recover from failure and stressors in sport.

Practical Applications

Findings from this study support the notion that SC is relevant for elite athletes' psychological well-being when they encounter stress or setbacks. Moreover, the findings offer initial support for the idea that SC promotes optimal physiological recovery from stress in sport on one specific measure: heart rate variability. Given the modifiable nature of SC (Mosewich et al., 2013; Neff & Germer, 2013), even following brief exposures (Breines & Chen, 2012; Leary et al., 2007), and the adaptive outcomes associated with this perspective, SC should be considered an important and effective target for intervention among athletes. Practitioners and stakeholders in sport should continue to explore ways to help athletes to relate to setbacks and failures in a more self-compassionate manner. For instance, encouraging athletes to challenge their beliefs about self-criticism, considering SC as a means of preventing future suffering, and reflecting about setbacks and failures with mindfulness, self-kindness and common humanity through writing have all been strategies used to develop SC in athletic samples (Mosewich et al., 2013; Rodriguez & Ebbeck, 2015). The latter strategy (self-compassionate writing) was used in an intervention study with self-critical female athletes and reduced athletes' rumination, concern

over mistakes and self-criticism (Mosewich et al., 2013). Further, in a general sample, participants' who listened to a 10-minute meditation designed to foster compassion for the self had significantly better physiological recovery and lower state anxiety following a laboratory stressor compared to control or attention control participants (Arch et al., 2014). Thus, brief exposures to SC training may have significant effects on athletes' abilities to deal with stress. Helping athletes to adopt a self-compassionate approach may help them to optimize their well-being, performance and recovery.

My findings added to other's work (Ferguson et al., 2014, Mosewich et al., 2013; Reis et al., 2015) who have shown that athletes struggle to emotionally manage failures and setbacks associated with sport and show that athletes' self-critical and ruminative tendencies may also have physical consequences. Thus, my findings suggest that it is necessary to have emotional supports for athletes to help them to effectively manage the highs and lows associated with sport. Mental performance consultants are increasingly being integrated into sport teams in order to help athletes develop mental skills to mentally prepare and perform on demand, but few (if any) practices are in place to help athletes to adaptively deal with failures and setbacks. If an athlete is sustaining emotional, and potentially physical stress, due to rumination, self-judgement or self-criticism, the use of mental skills for performance may be irrelevant and their psychological and physical recovery may be compromised. Thus, the integration of emotional supports for athletes such as clinical psychologists or counsellors that can help athletes to process difficult emotions and let go is of central performance. An additional and perhaps less resource intensive option would be to train coaches and team support staff about SC and teach them strategies to impart a more compassionate perspective to their athletes. This may involve training coaches to implement debriefing or reflection protocols that help athletes reflect about their failures or

shortcomings in a more compassionate manner. Further, by educating coaches of the benefits of SC and the costs of self-criticism, coaches can help athletes to recognize their self-critical tendencies and teach them to build more self-compassionate habits. Taken together, resources should be devoted to efforts such as these in order to help athletes, not only prepare for competition, but also to emotionally process failures and setbacks. Doing so may protect athletes from developing mental health problems or resorting to maladaptive coping strategies and could optimize their performance and recovery.

Conclusion

In this study, athletes with higher levels of SC showed adaptive psychological and physiological (higher heart rate variability) responses relative to a recalled sport failure compared to those lower in SC. These findings enhance the argument that SC is relevant and beneficial for athletes and offer additional support for the ability of SC to impact physiological responding to stress. Further, my study offers a unique contribution to the literature by demonstrating that fear of self-compassion can account for unique variance in athletes' psychological responses to failure. Taken together, my results suggest that athletes can benefit from developing their SC, but care should also be taken to address athletes' apprehension and resistance to offering themselves compassion in times of suffering. It is my hope that by demonstrating the psychological and physical benefits of SC, this perspective can be viewed as a resource that facilitates performance and longevity, rather than undermining them.

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Footnote

¹ Manipulation check questions pertaining to the image that participants generated during the stress induction were ranked on a scale ranging from 1 (e.g., “No emotion”) to 7 (e.g., “Very strong emotion”), with low responses reflecting low image quality and high responses reflecting high image quality.

Table 1

Participant characteristics

Characteristic	N	%
Ethnicity		
Caucasian	70	77
African	5	6
Aboriginal	4	4
Asian	2	2
Latin	1	1
American		
East Indian	1	1
Philippine	1	1
Other	7	8
Marital Status		
Single	3	3
Common Law	2	2
Other		
Sport Type		
Track and Field	20	22
Volleyball	18	20
Hockey	17	19
Soccer	8	9
Football	6	7
Basketball	4	4
Swimming	3	3
Cross Country	3	3
Rowing	3	3
Racquetball	2	2
Badminton	2	2
Ringette	2	2
Curling	1	1
Figure Skating	1	1
Rugby	1	1
Gender		
Female	53	58
Male	38	42

Table 2

Descriptive statistics and correlations of main and control variables

Measure	1	2	3	4	5	<i>M</i>	<i>SD</i>	α
1. Self-Compassion	-					3.10	.56	.91
2. Fear of Self-Compassion	-	-				17.91	9.49	.89
3. Self-Esteem	.48**					19.80	4.44	.82
	.61**	.50**	-					
4. Imagery Emotion	.01	-.16	-.11	-		4.76	.91	.70
5. Imagery Ease	.16	-.20	-.19	.65**	-	5.37	.85	.69

* $p < .05$ ** $p < .01$

Table 3

Descriptive statistics of physiological variables: Stress induction

Measure	Stress/Baseline	Min	Max	Raw <i>M</i>	Raw <i>SD</i>
Respiration rate	1.25	.77	1.90	14.63	2.56
Heart rate variability	.87	.34	1.63	65.45	22.19
Skin conductance	1.10	.59	1.62	7.30	4.22
Heart rate	1.05	.86	1.21	73.54	11.78

Note. Minimum and maximum values refer to change scores (stress relative to baseline), and not raw values.

Table 4

Descriptive statistics of physiological variables: Recovery phase

Measure	Recovery/Baseline	Min	Max	Raw <i>M</i>	Raw <i>SD</i>
Respiration rate	1.12	.72	1.81	13.22	3.00
Heart rate variability	.98	.52	1.73	75.59	27.99
Skin conductance	1.07	.51	1.62	7.07	4.15
Heart rate	1.00	.93	1.09	70.43	11.05

Note. Minimum and maximum values refer to change scores (stress relative to baseline), and not raw values.

Appendix A

Eligibility Screening

1. Are you an active member of a varsity sports team for the 2017/2018 season? Yes/No
2. If not, do you compete in your sport at the University, National or Provincial Level?
Yes/No
3. What is your sport? _____ Years at University/National/Provincial Level: _____
4. How old are you? _____
5. Medications: Please indicate if you are taking any of the following medication or substances (i.e., medication for depression, anxiety, ADHD, anabolic steroids, etc.):

Antidepressants (List)	
Anxiety Medication (List)	
ADHD Medication (List)	
Anabolic Steroids	
Medication for a Heart Condition (List)	
Allergy Medication (e.g., antihistamines)	
Other	

6. Have you experienced any head injuries? If yes, please specify (injury and date of occurrence):

Nature of Injury (e.g., fall, head to head contact, etc.)	Date of Occurrence	Saw Doctor? (y/n)	Doctor's Recommendations? (Describe)	Did you return to sport? If yes, when?

7. Did you experience any of the following symptoms? Are you currently experiencing any of them?

Symptom	At Time of Injury (Check if Yes)	Currently (Check if Yes)
Headache or Feel “pressure in the head”		
Neck Pain		
Vision problems – seeing stars/lights, photophobic, vacant stare, inability to focus		
Hearing problems – hear ringing in the ear (aka – tinnitus)		
Dizziness (feeling light headed) & balance problems		
Feeling “dinged” or “dazed” - felt like I had my bell rung o Disoriented – feel like they are “in a fog” or feeling slowed down		
Confused & easily distracted or having difficulty concentrating		
Poor coordination		
Slurred speech		
Drowsy or feeling fatigued (low energy)		
Memory problems		
Nausea & /or Vomiting		

Behaviour changes – more emotional than usual, irritable		
--	--	--

8. Can you recall a (recent) sport failure or setback experience that most impacted you, that you can remember well? Yes/No
9. When did this experience occur? _____

Appendix A.1

Motivational Imagery Measure for Sport- Arousal (MG-A)

Motivational Imagery Ability Measure for Sport (arousal subscale) (Gregg & Hall, 2006)

Instructions: This questionnaire involves creating images of eight situations in sport. After you image each scene, you will rate the imagery on two scales. Your ratings will be made on a 7-point scale, where 1 indicates difficulty forming the image or no emotional experience, and 7 is an easily formed image or a very strong emotional experience. Images that fall between these two extremes should be rated accordingly along the scale. There are no right or wrong ratings. Be as accurate as possible and take as long as you feel necessary to arrive at the proper ratings for each scene. The two scales are: emotional – emotions experienced while imaging the scene ease – the ease of forming the image.

Scenario 1. STEP 1 (read): Imagine yourself about to begin a competition in your sport. As you finish your preparations in the final few minutes before the competition begins you notice the feeling of some ‘butterflies in your stomach’. You notice your palms are a bit sweaty and your heart is beating a little quickly. You know these symptoms indicate that you are a little bit excited, this is good, and that you are ready to compete.

STEP 2: Now create and experience your image of the scene in your mind.

STEP 3: Next, complete the two scales below.

1. How strong was your emotional experience created by the image?

No Emotion							Very Strong Emotion
1	2	3	4	5	6	7	

2. How easy was it to form the image?

Not at all easy to form							Very easy to form
1	2	3	4	5	6	7	

Scenario 2. STEP 1 (read): Imagine yourself performing your warm-up in preparation for a competition in your sport. As you notice the sites and sounds of the competition venue you feel yourself becoming excited. The anticipation of competing makes your muscles twitch. You're feeling 'psyched up' and ready.

STEP 2: Now create and experience your image of the scene in your mind.

STEP 3: Next, complete the two scales below.

1. How strong was your emotional experience created by the image?

No Emotion							Very Strong Emotion
1	2	3	4	5	6	7	

2. How easy was it to form the image?

Not at all easy to form							Very easy to form
1	2	3	4	5	6	7	

Scenario 3. STEP 1 (read): Imagine yourself competing in your sport. During a break in the competition you observe how loose and relaxed you feel. Your breathing is deep and rhythmical. Mentally you feel at ease and are focused only on what you have to do. See yourself re-entering the competition, relaxed and ready to go.

STEP 2: Now create and experience your image of the scene in your mind.

STEP 3: Next, complete the two scales below.

1. How strong was your emotional experience created by the image?

No Emotion							Very Strong Emotion
1	2	3	4	5	6	7	

2. How easy was it to form the image?

Not at all easy to form							Very easy to form
1	2	3	4	5	6	7	

Scenario 4. STEP 1 (read): Imagine yourself participating in an important competition for your sport. You feel as though your arousal is at an optimal level. You sense excitement and anticipation within yourself, yet feel calm and in control.

STEP 2: Now create and experience your image of the scene in your mind.

STEP 3: Next, complete the two scales below.

1. How strong was your emotional experience created by the image?

No Emotion							Very Strong Emotion
1	2	3	4	5	6	7	

2. How easy was it to form the image?

Not at all easy to form							Very easy to form
1	2	3	4	5	6	7	

Appendix B

Demographic Questionnaire

1. Please indicate your age: _____
2. Please indicate the gender that you identify with: _____
3. Please outline your sport involvement (type of sports and years in sports):

4. Please indicate the sport that you are involved in (the sport that you are a member of your university's varsity sports team for or compete at a National level in): _____
5. How long have you played this sport at that level (years)? _____
6. Weekly training hours a) competitive season b) off season: _____
7. Current year in academic (university) program: _____
8. University major: _____

Appendix C

Self-Compassion Scale

HOW I TYPICALLY ACT TOWARDS MYSELF IN DIFFICULT TIMES

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

Almost never					Almost always
1	2	3	4	5	

- _____ 1. I'm disapproving and judgmental about my own flaws and inadequacies.
- _____ 2. When I'm feeling down I tend to obsess and fixate on everything that's wrong.
- _____ 3. When things are going badly for me, I see the difficulties as part of life that everyone goes through.
- _____ 4. When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world.
- _____ 5. I try to be loving towards myself when I'm feeling emotional pain.
- _____ 6. When I fail at something important to me I become consumed by feelings of inadequacy.
- _____ 7. When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am.
- _____ 8. When times are really difficult, I tend to be tough on myself.
- _____ 9. When something upsets me I try to keep my emotions in balance.
- _____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
- _____ 11. I'm intolerant and impatient towards those aspects of my personality I don't like.
- _____ 12. When I'm going through a very hard time, I give myself the caring and tenderness I need.
- _____ 13. When I'm feeling down, I tend to feel like most other people are probably happier than I am.
- _____ 14. When something painful happens I try to take a balanced view of the situation.
- _____ 15. I try to see my failings as part of the human condition.
- _____ 16. When I see aspects of myself that I don't like, I get down on myself.
- _____ 17. When I fail at something important to me I try to keep things in perspective.
- _____ 18. When I'm really struggling, I tend to feel like other people must be having an easier time of it.
- _____ 19. I'm kind to myself when I'm experiencing suffering.
- _____ 20. When something upsets me I get carried away with my feelings.
- _____ 21. I can be a bit cold-hearted towards myself when I'm experiencing suffering.
- _____ 22. When I'm feeling down I try to approach my feelings with curiosity and openness.
- _____ 23. I'm tolerant of my own flaws and inadequacies.
- _____ 24. When something painful happens I tend to blow the incident out of proportion.
- _____ 25. When I fail at something that's important to me, I tend to feel alone in my failure.
- _____ 26. I try to be understanding and patient towards those aspects of my personality I don't like.

Appendix D
Fear of Self-Compassion Scale

0	1	2	3	4
Do not agree at all				Completely agree

Below are a series of statements that we would like you to think carefully about and then circle the number that best describes how each statement fits you.

- | | | | | | | |
|----|--|---|---|---|---|---|
| 1. | I feel that I don't deserve to be kind and forgiving to myself | 0 | 1 | 2 | 3 | 4 |
| 2. | If I really think about being kind and gentle with myself it makes me sad | 0 | 1 | 2 | 3 | 4 |
| 3. | Getting on in life is about being tough rather than compassionate | 0 | 1 | 2 | 3 | 4 |
| 4. | I would rather not know what being 'kind and compassionate to myself' feels like | 0 | 1 | 2 | 3 | 4 |
| 5. | When I try and feel kind and warm to myself I just feel kind of empty | 0 | 1 | 2 | 3 | 4 |
| 6. | I fear that if I start to feel compassion and warmth for myself, I will feel overcome with a sense of loss/grief | 0 | 1 | 2 | 3 | 4 |
| 7. | I fear that if I become kinder and less self- | 0 | 1 | 2 | 3 | 4 |

	critical to myself then my standards will drop					
8.	I fear that if I am more self compassionate I will become a weak person	0	1	2	3	4
9.	I have never felt compassion for myself, so I would not know where to begin to develop these feelings	0	1	2	3	4
10.	I worry that if I start to develop compassion for myself I will become dependent on it	0	1	2	3	4
11.	I fear that if I become too compassionate to myself I will lose my self-criticism and my flaws will show	0	1	2	3	4
12.	I fear that if I develop compassion for myself, I will become someone I do not want to be	0	1	2	3	4
13.	I fear that if I become too compassionate to myself others will reject me	0	1	2	3	4
14.	I find it easier to be critical towards myself rather than compassionate	0	1	2	3	4
15.	I fear that if I am too compassionate towards myself, bad things will happen	0	1	2	3	4

Appendix E

Rosenberg Self-Esteem Scale

Instructions: Below is a list of statements dealing with your general feelings about yourself. To the left of each item, indicate how much you agree with the statement using the following scale:

1 = Strongly Agree 2 = Agree 3 = Disagree 4 = Strongly Disagree

- ___ 1. On the whole, I am satisfied with myself.
- ___ 2.* At times, I think I am no good at all.
- ___ 3. I feel that I have a number of good qualities.
- ___ 4. I am able to do things as well as most other people.
- ___ 5.* I feel I do not have much to be proud of.
- ___ 6.* I certainly feel useless at times.
- ___ 7. I feel that I'm a person of worth, at least on an equal plane with others.
- ___ 8.* I wish I could have more respect for myself.
- ___ 9.* All in all, I am inclined to feel that I am a failure.
- ___ 10. I take a positive attitude toward myself.

Appendix F

Stress Induction Imagery Script

You are about to take yourself through a guided imagery script. You will be guided through a scenario for two minutes. As you are listening, imagine yourself in the situation and fully experience the emotions created in as much detail as possible. Start by closing your eyes.

*“Remember a time when you **failed**... Maybe you made a costly mistake, failed to meet an important goal, or experienced a setback in your sport progress..... Imagine this experience..... In your mind, really try to take yourself back to this experience..... Remember your expectations leading up to this... Remember the pressures that you felt... Imagine what you were looking forward to and your hopes... Then remember the situation unfolding as it did... Remember where you were, what your surroundings looked like, who was there..... Take yourself back to the stressful situation in as much detail as possible..... Really focus on the feelings that you had..... Disappointment, anger, frustration, despair... Try to remember those feelings in as much detail as possible..... Really allow yourself to feel them... Remember the changes in your body.....tension, anxiousness, uneasiness..... Imagine this scenario in as much detail as possible..... Even after this moment or situation had passed, notice any feelings that remain: tension, regret, uneasiness..... Really try to take yourself back to the feelings and emotions that you experienced..... Now, please take a deep breath and gently open your eyes.*

Appendix G

Emotional Difficulty

Instructions: Using the below scale, please indicate how emotionally difficult your recalled scenario was for you at the time that it occurred.

1

2

3

4

5

6

("not at all") ("slightly") ("somewhat") ("moderately") ("very") ("extremely")

Appendix H
Image Quality

	Not at all Easy to Form						Very Easy to form
1. How easy was it for you to form the image?	1	2	3	4	5	6	7
	No Emotion						Very Strong Emotion
2. How strong was your emotional experience created by the image?	1	2	3	4	5	6	7
	Not clear at all						Very Clear
3. How clear was the image that you generated?	1	2	3	4	5	6	7
	Not at all meaningful						Very meaningful
4. How meaningful was the image that you generated?	1	2	3	4	5	6	7
	I did not feel the emotions at all						I felt the emotions very strongly
5. Rate how well you felt the emotions of the situation.	1	2	3	4	5	6	7
	Not at all						To a great extent
6. To what extent did you use the image that you generated?	1	2	3	4	5	6	7

Appendix I

Behavioural Reactions to Recalled Sport Scenario

Instructions: Please respond to the following questions about your reactions during the scenario that you recalled during the imagery task. During the time of the scenario that you recalled, to what extent did you react in the following ways:

1 2 3 4 5 6

(“not at all”) (“slightly”) (“somewhat”) (“moderately”) (“very”) (“extremely”)

1. I tried to be kind to myself
2. I tried to make myself feel better
3. I was really hard on myself
4. I kept the situation in perspective
5. I tried to do things to take my mind off of the problem
6. I expressed my emotions to let off steam
7. I took steps to fix the problem or made plans to do so
8. I sought out the company of others
9. I gave myself time to come to terms with it

Appendix J

Thoughts About Recalled Scenario

Instructions: Please respond to the following questions about your thoughts during the scenario that you recalled during the imagery task. During the time of the scenario that you recalled, to what extent did you think the following thoughts:

1 (“I did not think this thought at all”)

2 (“I thought this once”)

3 (“I thought this a few times”)

4 (“I thought this several times”)

5 (“I kept thinking this thought”)

1. I seem to have bigger problems than most people do _____
2. I’m a loser _____
3. This isn’t any worse than what lots of other people go through _____
4. Why do these things always happen to me? _____
5. In comparison to other people, my life is really screwed up _____
6. Everyone has a bad day now and then _____

Appendix K

Emotional Responses to Recalled Scenario

Instructions: Please respond to the following questions about your emotions during the scenario that you recalled during the imagery task. During the time of the scenario that you recalled, to what extent did you feel the following emotions:

1 2 3 4 5 6

(“not at all”) (“slightly”) (“somewhat”) (“moderately”) (“very”) (“extremely”)

1. Sad
2. Dejected
3. Down
4. Depressed
5. Nervous
6. Worried
7. Anxious
8. Fearful
9. Irritated
10. Angry
11. Hostile
12. Mad
13. Embarrassed
14. Humiliated
15. Guilty
16. Ashamed

Appendix L
Recruitment Poster

SPORT RECOVERY RESEARCH PROJECT



We require one hour of time from participants via an online questionnaire and a one-time lab session.

You **MAY** be eligible if you:

- Are a **current university level athlete** **OR**
- **Compete in your sport at a provincial or national level**
- AND**
- **Have experienced a distressing sport failure or setback**

This study will examine how psychological factors influence the body's physiological response to & recovery from stress. Findings may help to optimize your performance/recovery.

A few eligibility questions will be asked to ensure individuals meet the study's criteria.

To participate in this study, please email the researcher:
umceccal@myumanitoba.ca

This research is being conducted by Laura Ceccaloni a student at the U of M under the guidance of Dr. Toshiya Strudat from the Faculty of Kinesiology. Results will be disseminated through a thesis. This research has been approved by the Human and Animal Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122.

Faculty of Kinesiology and
Recreation Management



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of MANITOBA

Appendix M

Consent Form

Please read this form carefully and feel free to contact the researchers via phone or email if you have any questions.

Invitation to Participate: You are invited to participate in a research study conducted by Laura Ceccarelli and Dr. Shaelyn Strachan.

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Purpose of the Study: To examine the influence of psychological factors on athlete's psychological and physiological reactivity and recovery from stress. This examination may inform athletes how to optimize their performance and health when they encounter failure.

Procedures: The observational study will involve an online component, followed by a laboratory session. For the online component, participants will be asked to complete a baseline assessment which will involve filling out several questionnaires. This should take you between 10-20 minutes to complete. Next, the principal investigator will contact you to arrange for your laboratory session. The lab session will involve you completing a brief physiological assessment and some questionnaires. The physiological assessment will be six minutes long and will involve the use of biofeedback technology. You will be connected to several sensors to monitor your body's responses (e.g., sweat response, muscle tension, breathing and heart rate), to changing stimuli. This process is non-invasive: Sensors are placed on the surface of the skin and over clothing. Once you are connected to the equipment, you will be asked to remain calm for two minutes, and then will undergo a guided imagery activity to recall an experience from your sport. You will finish with two minutes of recovery time. Once the physiological assessment is complete, you will be unhooked from the biofeedback equipment, and you will be asked to answer some questions about the experience that you recalled (e.g., "What are your thoughts and feelings about the experience that you recalled?"). The lab session should take between 45-60 minutes. You will have the option to review your individual results at the conclusion of the laboratory session with the lead researcher.

Risks: Participation in this study will involve the disclosure of personal information, for example your age, year in sport and training schedule. However, all the information you provide will be kept in strict confidence, and no one other than the researcher and her advisor will be able to trace your answers back to you. Further, it is possible that you may experience some distress when recalling an experience from your sport. However, the risks associated with the study are not expected to surpass the risks associated with daily life. You can feel free to stop or withdraw from the study at any time with no penalty or consequence. The researcher will also provide you

with the contacts for additional psychological support services from your university, should you require them. If you require further psychological support due to the stress that you experienced during your involvement in this study, you can contact the Psychological Services Centre at the University of Manitoba at 204-474-9222 or the Student Counselling services at the University of Winnipeg at studentwellness@uwinnipeg.ca.

Benefits: You may be helping to contribute to the understanding of factors that influence adaptive physiological regulation in athletes. If you are interested, you can ask for the study results once they are available. However, it should be noted that these benefits are not guaranteed.

Confidentiality and Anonymity: If you decide to participate in the study, the information that you share will remain strictly confidential. Personal information and data will only be used to examine the research questions of this study. Only the principal researcher and her advisor will have access to your survey responses and any identifying information, and this will be kept on a password protected USB stick. Your electronic data will remain confidential as the online Canadian server that will be used to collect the data is secure and password-protected. Your contact information and responses will be kept on a password-protected USB stick in the principal investigator's locked office. Also, the principal researcher will merge your data with that of the other participants and once the data analyses have been completed and the project is finished, your contact information will be dissociated from the responses (no later than 03/2018). Aggregated data stemming from this research will be used for the principal investigator's master's thesis and may be presented at academic conferences and/or published in academic journals. Neither your name nor your contact information will appear in any publications stemming from this research.

Conservation of Data: When data collection is complete (not later than 03/2018), the electronic list that links participants' numbers with their names or email addresses will be destroyed, at which point it will be impossible for anyone, including the researcher or research assistant, to identify data with specific participants. This anonymous data will be stored in electronic form on a password protected USB storage device locked in the principal investigator's office or in a locked filing cabinet in her lab until 09/2021. The principal investigator and the research assistant will have access to this data. After the five-year period, all electronic data will be permanently deleted and any hard copies will be cross-shredded (09/2021). As this study is online, there will be no paper copies of any data or identifying information. Results from this study will be disseminated in the main investigator's thesis, through presentations at scholarly conferences and through publication in academic journals. At no time will individual responses be reported.

Voluntary Participation: You are under no obligation to participate and if you choose to participate, you can withdraw from the study at any time and/or refuse to answer any questions, without suffering any negative consequences. You may choose to withdraw from the study by emailing the research assistant or principal investigator, or by refraining from answering the questionnaires. If you choose to withdraw, you can ask that all of your data gathered until the

time of the withdrawal be deleted from computer files and the USB mass storage device, for hard copies to be cross-shredded, and for none of your data to be used in data analyses.

Acceptance: I agree to participate in the above research study conducted by Laura Ceccarelli and Dr. Shaelyn Strachan of the Faculty of Kinesiology and Recreation Management at the University of Manitoba.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

If you have any questions about the study, please do not hesitate to contact the study researchers. This research has been approved by the Education and Nursing Research Ethics Board. If you have any concerns or complaints about this project, you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122 or by email at humanethics@umanitoba.ca.

Principal Investigator

Laura Ceccarelli

Faculty of Kinesiology and Recreation Management (M.A. Candidate)

umceccal@myumanitoba.ca

Dr. Shaelyn Strachan

Assistant Professor, University of Manitoba, Faculty of Kinesiology and Recreation Management

(204) 474-6363

Shaelyn.Strachan@umanitoba.ca

Principle Investigator's Signature

Participant's Signature and Date

Appendix N

Day of Testing Considerations: How to Show Up

Hello! You are scheduled for your appointment to participate in the research study conducted by Laura Ceccarelli (M.A. (c), Faculty of Kinesiology and Recreation Management) on

_____. When monitoring your body's responses to changing experiences, it is important to be diligent in terms of preparation to ensure that we are obtaining accurate readings and results for your body. Prior to your appointment, we ask that you please ensure the following:

- Please refrain from consuming alcohol or using recreational drugs at least 48 hours before the appointment.
- Keep your caffeine intake to a minimum (normal or less than normal for you).
- If you wear contacts, please come wearing your glasses, or come prepared to remove your contacts for the duration of the testing (approximately 6 minutes).
- Please refrain from taking any medications for allergies or illnesses. If you are sick, please let the researcher know and we can reschedule.
- If you have abnormal sleep the night before, please contact the researcher to reschedule.

Thank you for your consideration of these terms. We appreciate your cooperation! This will ensure that our study results are as reliable and valid as possible. If you have any questions, please feel free to contact the researcher at [REDACTED] or by email at

umceccal@myumanitoba.ca. Thank you, and we look forward to seeing you!

Appendix O

Debriefing Form



Faculty of Kinesiology
and Recreation Management

102 Frank Kennedy Centre
Winnipeg, Manitoba
Canada R3T 2N2

Debriefing Form

You have now completed the study. Thank you very much for your time and participation! It is very valuable and contributes greatly to this research.

We ask that you please not share the information in this form with others who may be participating in the study. It is important that participants complete the study without knowledge of its specific purpose.

The purpose of this study was to examine the influence of psychological factors on athlete's psychological and physiological reactivity and recovery from stress. In particular, to determine if athlete's levels of self-compassion and fear of self-compassion impact their *physiological* and psychological reactivity and recovery from a recalled sport failure. A limited number of research has examined how these constructs impact psychological well-being and coping among athletes. In general, self-compassion is associated with positive aspects of health, well-being and adaptive coping when athletes encounter setbacks, while fear of self-compassion is linked to negative aspects of well-being and maladaptive coping in response to sport setbacks. However, no research to date has examined how these constructs promote/impede *physiological* regulation in response to stress. This examination may inform athletes how to optimize their performance and health when they encounter failure. Further, findings from this study may inform new strategies in order to promote psychological and physiological well-being among athletes.

Your participation in this study is voluntary, and you are free to withdraw at any time. Choosing to withdraw will not lead to any negative consequences for you. If you want your data removed, please contact the principal investigator.

If you require further psychological support due to the stress that you experienced during your involvement in this study, you can contact the Psychological Services Centre at the University of Manitoba at 204-474-9222 or the Student Counselling services at the University of Winnipeg at

studentwellness@uwinnipeg.ca.

If you have any questions or comments about this study, please contact the principal investigator or the research assistant. Again, we ask that you do not share the information presented here. It is possible that if participants know the whole purpose of the study, the results may be affected.

Thank you again for your involvement!

Principal Investigator

Laura Ceccarelli

Master's Candidate

University of Manitoba, Faculty of Kinesiology and Recreation Management

umceccal@myumanitoba.ca

Dr. Shaelyn Strachan

Academic Supervisor

Assistant Professor

University of Manitoba, Faculty of Kinesiology and Recreation Management

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(204) 474-6363

This research has been approved by the Education and Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122.

1. If you would like to learn more about the results of this study, please provide your email address. We estimate that the results of this study will be available by late 2017.

2. If you would like to be contacted about future research studies in our lab that you may be eligible for, please provide your email address below.

a) Be selecting "yes" I provide my consent to be contacted by Dr. Strachan or her research assistant(s) about future research studies/opportunities. A) Yes B) No

b) Email address that I can be contacted at: _____