Dispositional Mindfulness and Stress Among University Student-Athletes

by

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Abstract

Participating in university sport can introduce sources of stress, where the demands faced by student-athletes exceeds their perceived ability to cope. The purpose of this research was to examine individual differences in mindfulness – the nonjudgmental, purposeful direction of attention to experience – as a predictor of stress and stress-recovery in student-athletes. Student-athletes (N = 52) from Manitoba universities completed measures of mindfulness, stress, and personality during their competition season. Principal component analysis revealed two dimensions of stress within this sample: socio-emotional stress and feelings of fitness/exhaustion surrounding practice or competition. Mindfulness, when treated as a unitary construct, was related to both types of stress, but controlling for neuroticism eliminated this relationship. Using the five-facet model of mindfulness, acting with awareness and non-judging of experience were related to feelings of fitness/exhaustion, even when controlling for neuroticism. The results of this study may inform the assessment of stress and intervention strategies for student-athletes.

Keywords: mindfulness; stress; sport; Five Facet Mindfulness Questionnaire; Recovery-Stress Questionnaire; student-athletes

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Dispositional Mindfulness and Stress Among University Student-Athletes

Attending a college or a university presents a near endless array of opportunities as part of the student experience. One aspect for a subset of students is the opportunity to represent their school by participating and competing in a sport. Across Canada and around the world, young people choose to devote their time and physical and mental resources to honing their skills in an athletic endeavour. This choice requires dedication, patience, responsibility, and a drive to succeed, and often comes at a cost. Student-athletes face many demands, and participating in sport can be a source of stress. Stress can negatively impact one's health (DeLongis, Folkman, & Lazarus, 1988) and happiness (Schiffrin & Nelson, 2010), not to mention athletic goals (Nicholls, Polman, & Levy, 2012), and stress can accumulate over time (McEwen, 1998; Semmer, Mcgrath, & Beehr, 2005). It is valuable, then, to identify characteristics that influence how much and how quickly a student-athlete experiences and recovers from stress. These traits may serve as an early warning sign to athletes and coaches that some additional precautions may need to be taken at certain times during the season, and may help to inform the development and implementation of stress-reduction strategies. The concept of mindfulness (Kabat-Zinn, 1982) has received attention as a foundation of therapeutic approaches (Coelho, Canter, & Ernst, 2013; Kabat-Zinn, 2003; Kabat-Zinn et al., 1992). Mindfulness is the purposeful direction of one's attention to their present experience in a nonjudgmental way (Kabat-Zinn, 1994; Marlatt & Kristeller, 1999).In this paper, I will discuss the research I conducted relating the concepts of stress and mindfulness among collegiate student-athletes.

Student-Athlete Experiences

Sports occupy a prominent and unique place in the student experience. Teams generate revenue for the school through ticket and merchandise sales, athletes are celebrated and featured

in public relations, and student-athletes may decide where to attain their education based on the sport opportunities that are available. As of the 2017-18 academic year, fifty-six Canadian universities were members of U Sports (formerly Canadian Interuniversity Sport), the governing body that covers hundreds of teams and thousands of student-athletes across the country. Student-athletes typically spend upward of twenty hours per week in training or competition and often miss classes or receive academic accommodations while their sport is in season (Watt & Moore, 2001).

Athletes are vulnerable to the same challenges and stressors that are faced across the general population. Student-athletes must balance sport with many responsibilities, and this is commonly cited as a source of stress among athletes (Noblet & Gifford, 2002). For example, despite frequently missing time in the classroom, student-athletes are typically still expected to achieve strong grades to maintain competition eligibility (Cosh & Tully, 2014).

Stress in Sport

Stress is the perception that the demands of a situation exceed the individual's ability to cope (Lazarus & Folkman, 1984). Beyond balancing life as a student, athletes face a variety of sport-specific stressors, and how athletes cope with stress can influence the impact it has in different areas of their life.

Gould and colleagues (Gould, Jackson, & Finch, 1993) identified that champion figure skaters have to deal with relationship issues, expectations and pressure to perform, and psychological demands such as anxiety and self-doubt. Professional Australian footballers highlighted concerns about career stability and trajectory, injuries, and balancing sport with other responsibilities (Noblet & Gifford, 2002), while professional rugby players frequently cited injury concerns, and mental and physical mistakes (Nicholls, Holt, Polman, & Bloomfield,

2006). Golfers identified dealing with being observed and evaluated, differing levels of situational comfort, and trying to maintain momentum (Giacobbi, Foore, & Weinberg, 2004), while one study discovered that athletes in field hockey, soccer, gymnastics, rowing, swimming, track and field, dressage, fencing, golf, rugby union, and tennis all worry about the impressions that people form about them (James & Collins, 1997). This line of research showcases how varied and universal stress can be in the world of sport. Further research has studied the impacts that these stressors can have on athletes.

Impacts of stress in sport. When athletes experience prolonged stress without adequate recovery, they become susceptible to burnout (Cohn, 1990; Gould, Tuffey, Udry, & Loehr, 1996a, 1996b; Silva, 1990). Burnout is characterized by emotional exhaustion, depersonalization, and devaluation of sport (Raedeke, 1997; Raedeke & Smith, 2001). These negative attitudes and feelings can reduce the enjoyment that a person gets from his or her sport, or cause him or her to stop playing altogether (Gould & Whitley, 2009).

Stress also impacts how an athlete performs in competition. As achieving optimal performance is of great importance to athletes, it is worth understanding the psychological states that promote performance. It has been well documented that competition-related stress can cause significant anxiety among athletes (e.g., Martens, Vealey, & Burton, 1990). The argument that stress and anxiety negatively impact performance is supported by authors who suggest stress introduces factors that distract from task-focused behaviours (Suinn, 2005), research with athletes who report performing their best when they feel physically relaxed and mentally calm (Cohn, 1990), and meta-analyses that reveal negative linear correlations between cognitive anxiety and sport performance (Kleine, 1990; Woodman & Hardy, 2003). To avoid burnout and

improve performance, individuals involved with sport would benefit from having ways to cope with the stress that they experience.

Coping. Coping describes a person's efforts to manage specific stressors (Lazarus & Folkman, 1984). There has been significant attention paid to how people cope with stressful situations (Weinstein, Brown, & Ryan, 2009). Coping is considered to involve altering responses to stressful situations (Gross & Thompson, 2013; Larsen, 2000) using a variety of methods. These response-altering techniques have been categorized in different ways, as they often vary in function and intention (Crocker, Kowalski, & Graham, 1998). The most commonly used distinction has been between problem-focused coping, which involves directly altering the stressful situation, and emotion-focused coping, which focuses on the emotional distress caused by the situation (Lazarus & Folkman, 1984).

Coping has also been conceptualized using *trait* and *process* perspectives (Nicholls & Polman, 2007). The trait perspective suggests that people use past experiences and preferred strategies to cope with new stressful situations, as opposed to approaching each new context independently (Carver, Scheier, & Weintraub, 1989), while the process approach recognizes that no two situations are identical, and thus coping changes across situations. The process approach considers a person's internal influencers, such as their beliefs about themselves, their goals, and their values, as well as the external environment in which they are trying to cope (Lazarus, 1999).

A systematic review of existing sport-focused coping literature (Nicholls & Polman, 2007) found support for both the trait and process concepts of coping. Some studies revealed that athletes use the same coping techniques in every situation (the trait approach), while others found that specific stressors affected coping strategy (the process approach). Some research has

studied the coping strategies used by athletes in different sports, identifying such techniques as increasing effort (Crocker & Graham, 1995), relaxation and visualization (Gould, Eklund, & Jackson, 1992; Gould et al., 1993), seeking social support and suppressing competing activities (Hammermeister & Burton, 2001), and problem-focused coping (Madden, Kirby, & McDonald, 1989). Effective coping in sport has been associated with improved performance (Haney & Long, 1995; Pensgaard & Duda, 2003), lower anxiety (Campen & Roberts, 2001), and positive affect (Ntoumanis & Biddle, 1998), reflecting the value in having effective coping mechanisms.

Mindfulness

More recently, mindfulness has been proposed as a potential mechanism by which athletes may more effectively cope with stress and avoid problems like burnout (Bernier, Thienot, Codron, & Fournier, 2009; Gardner & Moore, 2004; Jouper & Gustafsson, 2013; Z. E. Moore, 2009). There has been some research in this area (Gustafsson, Davis, Skoog, Kenttä, & Haberl, 2015), but there is still relatively little data available that outlines the relationship between mindfulness and stress in athletes.

Though mindfulness practice has its origins in Eastern religious and meditative practices (Baer, 2003; Kabat-Zinn, 2003) and is often associated with Buddhism, it has been suggested that mindfulness is not particularly Buddhist. Instead, mindfulness can be seen as "an inherent human capacity" (Kabat-Zinn, 2003, p. 146) which we all experience to some degree. Some proponents of mindfulness practice encourage paying attention to external experiences, such as sights and sounds, while others emphasize the importance of internal thoughts, emotions, and physical sensations (Kabat-Zinn, 1994; M. M. Linehan, 1993), though all seem to agree that mindfulness practice should include adopting "an attitude of non-judgmental acceptance" (Baer, 2003, p. 125) of one's experiences.

Mindfulness theory. Brown and colleagues (K. W. Brown, Ryan, & Creswell, 2007) discussed a theoretical framework by which mindfulness facilitates positive physical and psychological well-being. First, they argued that nonjudgmental attention toward experiences encourages a sort of meta-cognitive stance, recognizing that thoughts and feelings are relatively unimportant until one attaches to them a particular view of reality (Hayes, 2004; Kabat-Zinn, 1990; M. Linehan, 1993). Previous researchers have suggested that this insight may discourage potentially harmful automatic or habitual thought patterns, such as rumination or obsession (K. W. Brown et al., 2007; Teasdale et al., 2002). Second, the sustained attention toward experiences, including negative experiences, associated with mindfulness may lead to desensitization and better coping through affect regulation (Borkovec, 2002). In contrast, avoidant coping strategies may be detrimental to extinguishing emotional responses (Broderick, 2005; Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Third, the Buddhist philosophies that are associated with mindfulness suggest that suffering is caused by a need for situations to be different than they are (Ekman, Davidson, Ricard, & Wallace, 2005). The nonjudgmental acceptance inherent to mindfulness allows for positive experiences and well-being, independent of circumstances (McIntosh, 1997; Tart, 1994). Fourth, Brown, Ryan, and Creswell (2007) discussed the relationship between mindfulness and health with respect to physical processes such as relaxation and pain tolerance, noting that it was still a relatively young topic of research, but there has since been further support for the effects of mindfulness interventions in improving these processes (e.g., Amutio, Martínez-Taboada, Hermosilla, & Delgado, 2015; Liu, Wang, Chang, Chen, & Si, 2013). Also, higher mindfulness was associated with less stress (K. W. Brown & Ryan, 2003). The theory posits that by reducing stress, more resources are left available to maintain other aspects of health and wellness. Finally, the integration of these

concepts (meta-cognitive insight, experiential exposure, detachment from the desire to change situations, and stress processing) may reflect that more mindful individuals are better able to act according to their choices and remain aware of themselves and their environments (K. W. Brown et al., 2007).

Mindfulness-based interventions. The majority of mindfulness research has focused on studying mindfulness in the context of interventions (Weinstein et al., 2009), which have shown clinically significant positive effects. Programs such as Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1982) and Mindfulness-Based Cognitive Therapy (MBCT) offer manualized intensive programs with eight to ten weekly group sessions and have been the most commonly used method of mindfulness training (Baer, 2003). MBSR and MBCT have shown to be effective in improving well-being (Grossman, Niemann, Schmidt, & Walach, 2004) and treating a variety of psychological afflictions including anxiety (Kabat-Zinn et al., 1992) and mood-related problems (Chiesa & Serretti, 2009; Goyal et al., 2014; Hofmann, Sawyer, Witt, & Oh, 2010; Khoury, Sharma, Rush, & Fournier, 2015), chronic pain (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985; Randolph, Caldera, Tacone, & Greak, 1999), depression (Fjorback, Arendt, Ornbol, Fink, & Walach, 2011; Hick & Chan, 2010; Kenny & Williams, 2007; Ma & Teasdale, 2004; Segal, Williams, & Teasdale, 2002; Teasdale, Segal, & Williams, 1995) and binge eating disorder (Kristeller & Hallett, 1999). Claims that MBSR is also useful for treating stress and depression, and improves quality of life for those with medical diseases were recently supported (Fjorback et al., 2011). Other effective mindfulness-based programs include Relapse Prevention (Marlatt & Gordon, 1985)**,** Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999), and Dialectical Behaviour Therapy (Baer, 2003; M. M. Linehan, 1993).

Dispositional mindfulness. Regular mindfulness practice and mindfulness-based interventions can also increase a person's trait-like, or dispositional, mindfulness (Anderson, Lau, Segal, & Bishop, 2007; K. W. Brown & Ryan, 2003; Carmody & Baer, 2008; Carmody, Reed, Kristeller, & Merriam, 2008; Greeson, 2009; Michalak, Heidenreich, Meibert, & Schulte, 2008; Robins, Keng, Ekblad, & Brantley, 2012; Shapiro, Brown, Biegel, & Permanente, 2007; Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). Dispositional mindfulness refers to a person's tendency to attend to their environment and experiences in a non-judgmental way (Baer, Smith, & Allen, 2004; Harrington, Loffredo, & Perz, 2014), and can vary significantly from person to person (Brown & Ryan, 2003).

Dispositional mindfulness has been related to less emotional distress and improved psychological well-being (Baer et al., 2008; Broderick, 2005; Greeson, 2009; Harrington et al., 2014), which includes such constructs as self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth (Ryff, 1989, 1995; Ryff & Singer, 1996). Mindfulness has also been related to various aspects of mental health including positive affect and lower anxiety (Shapiro et al., 2007) and lower levels of mood disturbance (K. W. Brown & Ryan, 2003).

Upon examining existing mindfulness self-report questionnaires, Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) concluded that a multidimensional concept of mindfulness allows for the most complete understanding of the construct, and is best for determining its relationship to other variables. This review and factor analysis of previously established mindfulness assessment tools provided our current understanding of dispositional mindfulness as made up of five distinct facets (Baer et al., 2006). These five facets are *observing* (noticing or attending to internal and external experiences such as sensations, cognitions, emotions, sights,

sounds, and smells), *describing* (labeling internal experiences with words), *acting with awareness* (attending to one's activities of the moment, the opposite of "being on automatic pilot"), *non-judging of inner experience* (taking a non-evaluative stance toward thoughts and feelings), and *non-reactivity to inner experience* (the tendency to allow thoughts and feelings to come and go without getting caught up in or carried away by them; (Baer et al., 2008).

Mindfulness and stress. Previous research has demonstrated that more mindful individuals experience less stress. In their research with college students, Weinstein, Brown, and Ryan (2009) showed that trait mindfulness predicted lower perceived stress, less avoidant coping, and less anxiety in response to a stressful situation. Other research has shown that trait mindfulness predicts less severe physical and psychological reactions to stress (K. W. Brown, Weinstein, & Creswell, 2012; Bullis, Bøe, Asnaani, & Hofmann, 2014; Creswell, Pacilio, Lindsay, & Brown, 2014).

Similarly, the degree to which a person is mindful impacts how they cope with the stressors they face. Adopting an approach of cognitive appraisal involves noticing and evaluating one's emotions (a key facet of mindfulness), and has been shown to predict significantly less stress (Gaab, Rohleder, Nater, & Ehlert, 2005; S. A. Moore, Zoellner, & Mollenholt, 2008; Myers et al., 2012; Rohrmann, 1999). Mindfulness has been shown to increase approach-focused coping techniques (Weinstein et al., 2009) such as cognitive appraisal.

Within the context of sport, Gustafsson, Davis, Skoog, Kentä, and Haberl (2015) examined how mindfulness relates to such concepts as perceived stress and burnout among young elite athletes. They showed that mindfulness is negatively associated with three key contributors to athlete burnout; physical and emotional exhaustion, sport devaluation, and reduced sense of accomplishment. Other research has shown that athlete burnout is closely

related to stress (Gustafsson & Skoog, 2012; Raedeke & Smith, 2004; Tabei, Fletcher, & Goodger, 2012). However, existing research seems to have only looked at mindfulness in a fulsome way, without being so specific as to talk about individual facets. This presents a gap in literature that can be addressed by studying relationships between the different facets of mindfulness and stress.

Mindfulness and recovery. Britton, Shahar, Szepsenwol, & Jacobs (2012) demonstrated that mindfulness-based training can facilitate faster recovery from stressors that produce negative affect, such as giving a speech before a panel of judges. This type of scenario is similar to the evaluative nature of sport competition, where an athlete's performance is assessed either in terms of on-field production or by their coaches and teammates. Further, Arch and Craske (2010) demonstrated that among both clinically anxious and non-anxious participants presented with a stress-inducing stimulus, greater mindfulness led to weakened anxiety responses in the form of less stressor-related anxiety, less negative affect, and, notably, a shorter duration. Bahnert, Norton, and Lock (2013) conducted a study with Australian Football League players over the course of repeated one-week training and competition cycles. When asked to rate various aspects of recovery, including fatigue, muscle soreness, sleep quality, and stress levels, the players exhibited a consistent pattern, with an increase in stress in the days leading up to competition, followed by a gradual decrease over the days after competition. This line of research suggests that while most athletes recover from stress- and anxiety-inducing situations in a roughly linear fashion, dispositional mindfulness may predict the rate at which an athlete recovers from stress, with more mindful athletes recovering at a faster rate than their less mindful counterparts.

Mindfulness and performance. By the mid-2000s, scholars had identified that despite more than 30 years of applied use, none of the traditional techniques used for enhancing

performance (e.g., imagery, goal-setting, self-talk, etc.) had proved effective (Gardner & Moore, 2006; Z. E. Moore, 2003). This realization inspired the development of a mindfulness-based approach to athletic performance enhancement (Gardner & Moore, 2007). A series of research studies using a mindfulness and acceptance approach followed, with consistently positive results (see Gardner & Moore, 2012).

Mindfulness and acceptance approaches have been used with a range of athletes in both individual and team sports. This includes research with swimmers (Bernier et al., 2009; Mardon, Richard, & Martindale, 2016), runners (De Petrillo, Kaufman, Glass, & Arnkoff, 2009), archers, golfers (Kaufman, Glass, & Arnkoff, 2009), curlers, volleyball players, hockey players, and tennis players (Rothlin, Birrer, Horvath, & Grosse Holtforth, 2016). The link between mindfulness and improved performance has been shown using a variety of methods. Quantitatively, research by Thompson et al. (2011) showed that a mindfulness-based intervention with distance runners, archers, and golfers resulted in increased trait mindfulness, particularly the ability to act with awareness, and improved race times for the runners. Additionally, Gooding and Gardner (2009) determined that mindfulness predicted in-game free-throw percentage among collegiate basketball players. The connection between mindfulness and sport performance has also been shown qualitatively, using measures like self-report, coach-report, and subjective rankings or scoring. Kabat-Zinn, Beall, and Rippe (1985) provided mindfulness training to collegiate and Olympic rowers. The collegiate rowers who received the training exceeded their coaches' expectations, while interviews with the Olympic rowers revealed that the mindfulness training helped them to perform to their potential. Bernier, Thienot, Codron, and Fournier (2009) conducted two studies with swimmers and golfers. In qualitative interviews, the swimmers reported that optimal performance states shared many characteristics

with mindful acceptance. In their study with the golfers, the researchers provided a mindfulness-based intervention to one group of athletes, and traditional psychological skills training to a control group. The group receiving the mindfulness-based training improved their national rankings and achieved competition goals, while the control group did not. Finally, in their research with young female gymnasts, Jones, Swain, and Hardy (1993) demonstrated that how the athletes' perceived their internal state (in this case, their pre-competition anxiety) was more predictive of performance than the intensity of their anxiety, with the athletes who interpreted their anxiety as facilitative performing better than the athletes who viewed their anxiety as debilitative.

In sum, student-athletes are susceptible to stress that results from participating in sport. However, previous research suggests that mindfulness may lead to more effective coping. Therefore, I predicted that mindfulness would be related to decreased stress, faster recovery, and increased satisfaction with performance among collegiate student-athletes.

Method

Participants

The participants (N = 52, 48.1% female, age 18-26 years, M = 19.5 years) in this study were student-athletes from the University of Manitoba, University of Winnipeg, and Brandon University, competing in volleyball, basketball, hockey, swimming, and track-and-field. Many student-athletes are involved in competitive sport from a young age, often specializing in a sport by the time they reach high school (Baker, 2003). Two other participants were excluded due to missing mindfulness or stress data, and one participant withdrew consent, resulting in the final sample of 52. To determine the required sample size for this study, I first estimated the size of the relationship between dispositional mindfulness would have on stress and recovery. Two

meta-analyses of MBSR interventions revealed moderate to large effect sizes for treating stress and related problems such as depression and anxiety (Grossman et al., 2004; Khoury et al., 2015). Using Cohen's (1988) widely accepted guidelines, a medium effect corresponds to a Cohen's $d = 0.50$. Other research has demonstrated that an increase in mindfulness, as measured by the FFMQ, significantly predicts a medium-large decrease in perceived stress ($r = 0.44$, $p < .001$) and increase in psychological well-being ($r = 0.49$, $p < .001$; Carmody & Baer, 2008). This body of work suggested that I could expect at least a medium strength relationship (approximately $r = 0.40$) between mindfulness and stress.

A power analysis was conducted using the computer software G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) to determine the required sample size. Aiming for 80% power, I would need to recruit at least eighty (80) participants to detect an effect of $r = 0.40$, $p < .05$. The obtained sample clearly fell short of this goal.

The first major challenge encountered during this study had to do with participant recruitment and attrition. Among the three universities involved with this study, the teams whose competition schedules aligned with the timeline of the project comprised a total of 375 athletes. Only a select number of coaches provided permission to contact and recruit their athletes, reducing the potential participant pool to 237 athletes. After in-person recruitment, 97 individuals provided consent to participate and valid contact information. Despite multiple reminders to those who had provided consent and not yet completed surveys, only 52 participants completed the baseline questionnaires, 20 completed the pre-competition surveys, and 15 completed the follow-up surveys two weeks after competition. Despite what should have been a sufficiently large pool of participants from which to draw, the practical realities of recruitment difficulties and attrition presented a significant problem for the proposed research,

which I discuss later. Of note, the baseline sample size is minimally adequate for the principal components and multiple regression analyses reported here.

Materials

The five-facet conceptualization of mindfulness inspired the creation of the 39-item Five Facet Mindfulness Questionnaire (FFMQ-39; Baer et al., 2006, 2008). The FFMQ-39 combined items from existing instruments to form a unique measurement tool. The final items were selected based on the degree to which they uniquely load onto only one of the identified facets (i.e., items that loaded highly onto one facet, and not onto any other facet). More recently, two short-form versions of the instrument have been created, each named according to the number of items: the FFMQ-24 (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011) and FFMQ-15 (Baer, Carmody, & Hunsinger, 2012; Gu et al., 2016).

In this study, dispositional mindfulness was measured using the FFMQ-15 (see Appendix A). Items are assessed on a 5-point Likert scale from 1 (*Never or very rarely true*) to 5 (*Very often of always true*) and includes items such as *"I'm good at finding words to describe my feelings"* and *"I find myself doing things without paying attention."* The FFMQ-15 was shown to have similar reliability and validity characteristics to the full version, supporting its use in research where brevity is valued (Gu et al., 2016). To encourage participation, the FFMQ-15 was used in this research. The FFMQ-15 includes three items related to each of the five facets of mindfulness. Scoring can be done in two ways, with either all 15 items being averaged together to create a full-scale mindfulness score, or each facet examined individually to provide more specific data. Each of the scales for the five proposed facets offers good reliability, with alpha coefficients ranging from 0.75 to 0.91 (Baer et al., 2008). It has been validated with both clinical

and non-clinical samples while using language that can be understood equally well by experienced meditators and non-meditators (Baer et al., 2008).

Stress was measured using the Recovery-Stress Questionnaire for Athletes (RESTQ-Sport; Kellman & Kallus, 2001). The RESTQ-Sport assesses the mental and physical impacts of stress created by the sport environment, as well as the effectiveness of recovery strategies. The RESTQ-Sport has shown good internal consistency (Cronbach's α = 0.67-0.89; Kellman, 2010) and test-retest reliability (r > 0.79; Kallus, 1995), and has been used with athletes in a variety of individual and team sports and countries (including Canada) during preparation for major athletic events such as World Championships and Olympic games (Bouget, Rouveix, Michaux, Pequignot, & Filaire, 2006; Coutts, Wallace, & Slattery, 2007; Filaire, Rouveix, & Duclos, 2009; Kellmann & Gunther, 2000; Mäestu, Jürimäe, Kreegipuu, & Jürimäe, 2006).

The 52-item version of the scale (RESTQ-52 Sport) includes ten scales related to stress, with seven scales measuring what the authors describe as *general stress* (Scales 1-7) and three scales measuring *sport-specific stress* (Scales 13-15, see Appendix B; Kellman & Kallus, 2001). These ten scales comprise twenty-six (26) items, such as *"In the past (3) days/nights I was fed up with everything"* and *"In the past (3) days/nights I felt under pressure"* from the general stress scales. Items from the sport-specific stress scales include *"In the past (3) days/nights I felt burned out by my sport"* and *"I dealt with emotional problems in my sport very calmly."* Once again in the interest of encouraging participation and completion of the surveys, these ten subscales were selected from the RESTQ-52 Sport and organized as a brief version of the instrument. Compared to the RESTQ-52 Sport, this abbreviated form of the instrument (RESTQ-26, see Appendix C) makes completing the questionnaire a more manageable request of participants in a research setting.

To allow for the possibility to distinguish the impact of personality characteristics, participants were administered select items from the Ten-Item Personality Inventory (TIPI, Appendix D; Gosling, Rentfrow, & Swann, 2003). Previous literature suggests that mindfulness may be related to the traits of openness to experience and neuroticism (Baer et al., 2006), and mindfulness has been found to mediate the relationship between neuroticism and subjective well-being (Wenzel, von Versen, Hirschmüller, & Kubiak, 2015). Meanwhile, neuroticism has been associated with less adaptive coping and increased stress (Gunthert, Cohen, & Armeli, 1999). For these reasons, the four items selected were those related to the constructs of neuroticism and openness to experience.

To assess changes in stress over time, participants were asked to complete the Recovery Cue Inventory (RCI, Appendix E; Kellmann, Patrick, Botterill, & Wilson, 2002). The RCI is a 7-item measure that provides a quick and reasonable method for measuring stress daily.

Finally, a single item ("On a scale from *0 (Poor)* to *10 (Excellent)*, how would you rate the quality of your athletic performance?") was used to assess athletes' performance during competition, referred to as the Single-Item Performance Scale (SIPS; see Appendix F).

Procedure

Participants were recruited in person at a team meeting or practice, with permission from the team's coach. Informed consent (see Appendix G) was obtained from athletes who were interested in the study, and individuals who agreed to participate in this study provided their name and e-mail address so they could be e-mailed links to online surveys, which they could complete from a personal computer or mobile device. The first survey was administered early in the competition season, though the exact date varied by team based on when recruitment could be scheduled. The first administration ("baseline") consisted of the FFMQ-15, RESTQ-26 Sport,

and TIPI. The second administration ("pre-competition") was arranged for one week prior to a major event or competition, identified for each team with the help of their coaching staff. Hardy (1992) suggests that "cognitive anxiety may be elevate as much as two weeks before an important event, and generally remains fairly stable throughout the period leading up to the event" (p. 617). Collecting data one week prior to a major event allows for a meaningful evaluation of participants' stress levels while being minimally intrusive. The second administration included only the RESTQ-26 Sport. Beginning one day following the major competition ("post-competition") and lasting for two weeks, participants were given the RCI each day – the first day after competition also included the SIPS. On the last day ("follow-up"), the surveys included the RESTQ-26 Sport and the RCI. Data collection took place between January and March 2018.

Participants were offered an incentive for participating in this study. Each participant received one entry into a draw for one of six $50 Amazon.ca gift cards, and an additional entry for each survey that was completed. The University of Manitoba Psychology/Sociology Research Ethics Board approved the above procedure.

Results

The purpose of this study was to examine the stress recovery process of student-athletes over time, in relation to dispositional mindfulness. To this end, student-athletes provided responses to a baseline questionnaire measuring stress and dispositional mindfulness, and to repeated assessments of stress before and after an important competition. A growth curve analysis of these data was planned, but the resulting data set fell short of the requirements of the planned analysis in several ways.

Both the sign-up and the attrition rates contributed to the problem of having too few observations to complete the planned analysis. Furthermore, to the extent that change could be examined, there was little evidence to suggest that stress rose and recovered around the competition event. Among the 11 student-athletes who provided both pre- and post-competition stress measures, the means at each time point were similar (M = 2.91, SD = .70 and M = 2.71, SD = .52, respectively), $t(10) = 0.825$, $p > .05$. Whether this was due to measurement error, sample size, or individual differences in stress-responding that were much larger than situational differences for the selected competition, the premise of the planned stress-recovery analysis was not supported. Therefore, I made the decision to focus on the data provided at baseline. These data presented a sufficiently large and relevant sample to investigate certain relationships between stress and dispositional mindfulness, in the context of university-level sport.

Revised Goals

The revised goals of the project were three-fold. All three probed for features of the mindfulness-stress relationship that were specific, unique to sport, and amenable to future intervention. First, I examined the proposed structure of the RESTQ-Sport. The original authors suggest a two-factor structure, distinguishing between general stress, encountered by athletes and non-athletes alike, and specific stress, encountered specifically by athletes (Kellmann & Kallus, 2001). The RESTQ-Sport includes seven subscales that it relates to general stress (e.g., emotional stress, social stress, and conflicts/pressure), and three subscales that it relates to specific stress (i.e., disturbed breaks, burnout/emotional exhaustion, and fitness/injury). Using exploratory factor analysis to test for this or a similar structure on the present sample would allow for subsequent analyses to distinguish the sport-specific consequences of mindfulness. As seen with previous analyses of the RESTQ-Sport (e.g., Davis IV, Orzeck, & Keelan, 2007;

González-Boto, Salguero, Tuero, Márquez, & Kellmann, 2008; Kellmann & Kallus, 2001; Martinent, Decret, Filaire, Isoard-Gautheur, & Ferrand, 2014; Nicolas, Vacher, Martinent, & Mourot, 2015), the proposed structure of the instrument sometimes shows variation among research samples. Analyzing the structure of the instrument with respect to the present sample would ensure that subsequent analyses are relevant to the collected data.

Second, I sought to differentiate mindfulness from potentially overlapping features of personality that are also predictive of stress. Previous literature suggests that mindfulness may be related to the traits of openness to experience and neuroticism (Baer et al., 2006), and neuroticism has been closely linked to stress (e.g., Gross, Sutton, & Ketelaar, 1998; Gunthert et al., 1999; Zautra, Affleck, Tennen, Reich, & Davis, 2005). Using regression analysis to control for the influence of these factors would allow for consequences to be identified that are unique to mindfulness and possibly amenable to intervention among student-athletes.

Third, I examined whether the five separate facets of mindfulness have distinct consequences for sport-specific stress. Using regression analysis to compare their relative influence on sport-specific stress outcomes would provide a fine-grained picture of the most applicable features of mindfulness to seek to train in an athletic context.

Structure of the RESTQ-Sport

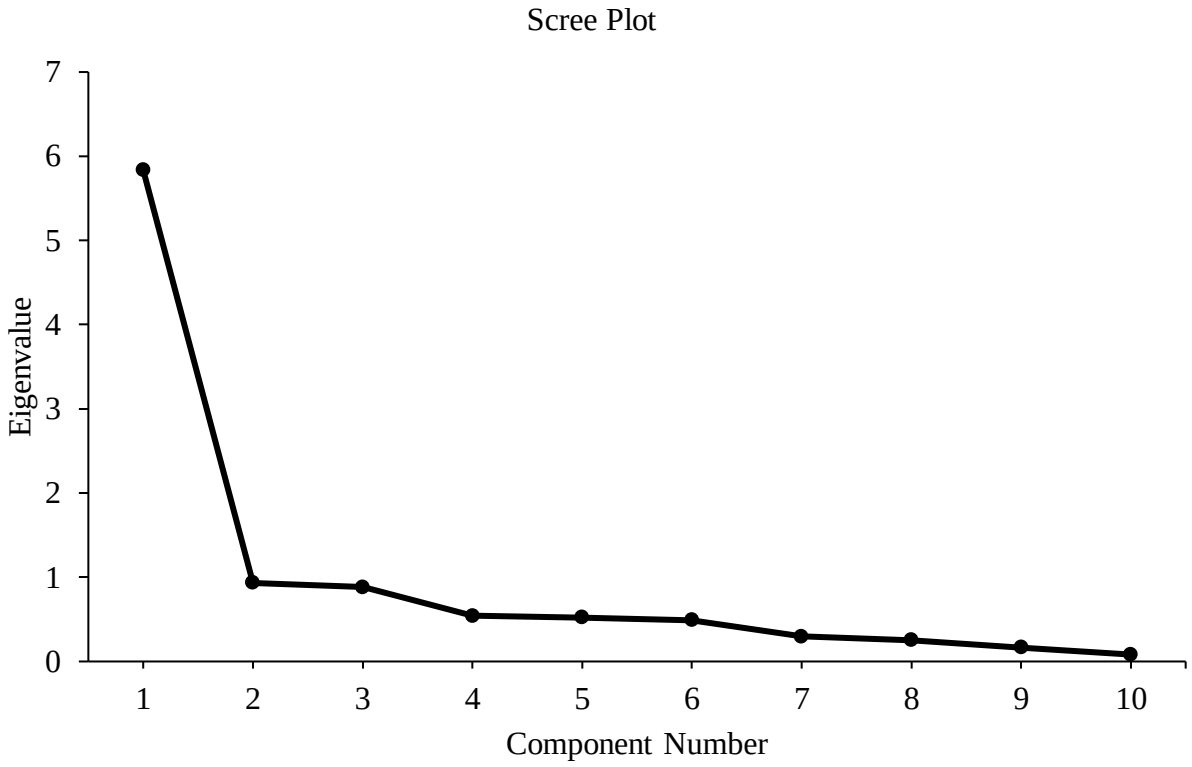
I conducted a principal component analysis (PCA) to examine the proposed structure of the RESTQ-Sport. The choice of PCA is appropriate to the goal of explaining the highest percentage of variance between participants, with the least number of components among a set of related measures. It was of further interest to this study whether the number and interpretation of components in this sample would correspond with the proposed theoretical structure of the RESTQ-Sport. The data submitted to this analysis consisted of the ten subscale scores proposed

by the RESTQ-Sport. With a sample of 50 student-athletes, an analysis at the item level could not be performed.

Figure 1 shows a scree plot of the PCA. Extraction of two components was specified on an a priori basis. However, the scree plot supports a similar decision would result from the common rule of using eigenvalues ≥ 1.

Figure 1

Scree Plot of Principal Component Analysis



To ease the interpretability of the components, orthogonal (varimax) rotation was applied.[1] Loadings of RESTQ-Sport subscales on the rotated components, together with the communalities and percent of variance accounted for by each component are presented in Table 1.

[1]After oblique rotation, which would minimize the amount of cross-loading, the pattern remained. As there did not appear to be a benefit to using oblique rotation, orthogonal rotation was maintained.

Table 1

Subscale Component Loadings of the RESTQ-Sport

		Component		
RESTQ-Sport Subscale	RESTQ-Sport Interpretations	1	2	h^2
Social Stress	General Stress	.90		.86
Emotional Stress	General Stress	.87		.87
General Stress	General Stress	.83		.76
Conflicts/Pressure	General Stress	.77		.75
Somatic Complaints	General Stress	.72		.60
Lack of Energy	General Stress	.50	.57	.57
Fatigue	General Stress	.48	.49	.46
Fitness/Injury	Specific Stress		.86	.74
Disturbed Breaks	Specific Stress	.41	.67	.62
Burnout/Emotional Exhaustion	Specific Stress	.42	.61	.55
Percent of Variance		41.98	25.72	
Total Percentage		41.98	67.70	
Interpretation		Socio-Emotional Stress	Fitness/Exhaustion	

Note: Component loadings < .4 are blank in the table.

The original theoretical interpretations were largely supported in the present sample, with two a priori components accounting for approximately 68% of the variance between participants across the 10 subscale scores. Five of the seven subscales linked to general stress loaded together on the first component and have minimal cross-loadings with the second component. All three of the sport-specific stress subscales loaded together on the second component and had minimal or clearly lower cross-loadings on the first component. Finally, communalities (h^2) for these subscales show that a majority of variance in each was accounted for by the two components together. Two subscales – Lack of Energy and Fatigue – did not load highly (relative to other

subscales) or uniquely on either component, and less than half of the variance in fatigue scores was explained by the components together.

For these reasons, for subsequent analyses I chose to compute subscale scores by a) averaging the five subscales together that represent the first component, labeled socio-emotional stress according to the highest-loading subscales, and b) averaging the last three subscales together to represent the second component, labeled fitness/exhaustion.

Controlling for Personality Factors in the Mindfulness-Stress Relationship

To differentiate mindfulness from potentially overlapping dimensions of personality, I conducted linear regression analyses of each component score, as related to dispositional mindfulness and relevant dimensions of personality. Independent variables were selected for inclusion in these analyses if they displayed significant correlations with the dependent variable. Table 2 presents descriptive statistics and correlations for the variables of interest in this study. Of note are the significant relationships between both socio-emotional stress and fitness/exhaustion, full-scale mindfulness, and neuroticism.

Table 2

Pearson Correlations Among Study Variables

	M	*SD*	Full-Scale Mindfulness	Observing	Describing	Acting with Awareness	Non-judging of Experience	Non-reactivity to Inner Experience	Neuroticism	Openness	Socio-Emotional Stress	Fitness Exhaustion
Full-Scale Mindfulness	3.30	.42	1									
Observing	3.15	.77	.587**	1								
Describing	3.43	.77	.738**	.314*	1							
Acting with Awareness	3.27	.74	.336*	-.217	.324*	1						
Non-judging of Experience	3.41	.83	.524**	.097	.281*	.037	1					
Non-reactivity to Inner Experience	3.20	.81	.484**	.393**	.095	-.210	.009	1				
Neuroticism	2.90	1.69	-.522**	-.136	-.367**	-.155	-.348*	-.342*	1			
Openness	5.03	1.05	.477**	.202	.359**	.100	.316*	.303*	-.153	1		
Socio-Emotional Stress	2.81	1.19	-.312*	.005	-.225	-.227	-.366**	.038	.526**	-.028	1	
Fitness/Exhaustion	2.65	.90	-.402**	.089	-.291*	-.389**	-.517**	-.009	.399**	-.083	.648**	1

Note: * $p < .05$, ** $p < .01$

Multiple regression procedures are built on several assumptions. The first assumption is that relationships between the independent and dependent variables are linear. The second assumption is that residuals are normally distributed, and the third is that the variance of residuals is homogeneous across levels of the predictor variables. In cases with multiple independent variables, it is also important that the independent variables are not excessively collinear. I tested each of these assumptions to ensure that it was appropriate to use multiple regression in this analysis. Linearity was assessed through a visual inspection of a scatterplot of the data, with each independent variable along one axis and the relevant dependent variable to be compared along the other. Normality was assessed by creating a frequency distribution of the residuals between observed and predicted scores and inspecting for normality, as well as with Kolmogorov-Smirnov and Shapiro-Wilk tests. Homogeneity of variance was assessed by plotting the standardized predicted values against the standardized residual values and looking for a systematic increase or decrease in the residuals according to predicted values. All assumptions were satisfied for all regression models, except for one – the assumption of normality was violated in the case of mindfulness as it relates to socio-emotional stress. To account for this, statistical significance decisions regarding this relationship were made using a more stringent significance criterion (i.e., $p < .01$ rather than $p < .05$).

The data were also screened for potential outliers. Checking for univariate outliers was done by inspecting mean and extreme scores, and skewness of the distribution for each variable included in this study. No cases were identified as potential univariate outliers. Possible multivariate outliers were screened by calculating Mahalanobis distances, tested against a chi-squared distribution at $p < .001$. No cases met or exceeded the critical cut-off value, suggesting there were no multivariate outliers.

Table 3

Types of Stress Related to Mindfulness, Neuroticism, and Openness

IV	B	β	*t*	95% CI
DV: Socio-Emotional Stress				
Fitness/Exhaustion	.715	.538***	4.558	[.399, 1.032]
Neuroticism	.248	.357**	2.819	[.071, .426]
Openness	.050	.044	.366	[-.225, .324]
Mindfulness	.199	.071	.492	[-.616, 1.015]
Model R^2	.512			
Model $F(4,45)$	11.823***			
DV: Fitness/Exhaustion				
Socio-Emotional Stress	.442	.588***	4.558	[.246, .637]
Neuroticism	-.022	-.042	-.293	[-.173, .129]
Openness	.047	.055	.439	[-.168, .262]
Mindfulness	-.566	-.268	-1.838	[-1.185, .054]
Model R^2	.467			
Model $F(4,45)$	9.853***			

Note: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

When assessing each type of stress, a hierarchical model was built – first controlling for the other type of stress, then the measured dimensions of personality, and finally the independent variable(s) of interest. The complete models are presented in Table 3. Fitness/exhaustion was significantly related to socio-emotional stress ($\beta = .648$, $F(1,48) = 34.663$, $t = 5.888$, 95% CI [.568, 1.156], $p < .001$, $R^2 = .419$), and subsequently controlling for personality ($F(3,46) = 15.945$, $p \leq .001$, $\Delta R^2 = .090$, $p < .05$) showed that neuroticism was uniquely related to socio-emotional stress ($\beta = .331$, $t = 2.902$, $p \leq .01$) while openness to experience was not ($\beta = .073$, $t = .692$, $p > .05$). When controlling for fitness/exhaustion and other dimensions of personality, mindfulness was not significantly related to socio-emotional stress ($\Delta R^2 = .003$).

Socio-emotional stress was significantly related to fitness/exhaustion, as seen in the previous analysis. Controlling for personality did not account for significant additional amount of the variance in fitness/exhaustion ($F(3,46) = 11.420$, $p \leq .001$, $\Delta R^2 = .008$, $p > .05$), as neither

neuroticism (β = .068, *t* = .512, 95% CI [-.105, .176], *p* > .05) nor openness (β = -.055, *t* = -.480, 95% CI [-.241, .148], *p* > .05) was uniquely related to fitness exhaustion. When controlling for socio-emotional stress and other dimensions of personality, mindfulness was not significantly related to fitness/exhaustion and did not account for a significant amount of the variance (ΔR^2 = .040, *p* > .05).

Mindfulness Facets in Relation to Socio-Emotional Stress and Fitness/Exhaustion

Examining the relationship between unique facets of mindfulness and the types of stress measured in this study, I arranged similar hierarchical regression models. The assumptions of linear regression were tested, and all assumptions were found to be satisfied. No differences from the previous analysis regarding socio-emotional stress were found – the non-judging facet of mindfulness was not significantly related to socio-emotional stress when controlling for other variables. Fitness/exhaustion, however, was significantly associated with certain distinct facets of mindfulness (see Table 4).

Table 4

Types of Stress Related to Facets of Mindfulness and Personality

IV	B	β	*t*	95% CI
DV: Fitness/Exhaustion				
Socio-Emotional Stress	.341	.453**	3.705	[.155, .526]
Neuroticism	-.004	-.007	-.055	[-.135, .128]
Openness	.065	.076	.699	[-.122, .251]
Describing	-.025	-.022	-.182	[-.308, .257]
Acting with Awareness	-.330	-.275*	-2.571	[-.588, -.071]
Non-judging of Experience	-.383	-.362**	-3.166	[-.627, -.139]
Model R^2	.585			
Model *F*(6,43)	10.103***			

Note: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

The model including unique facets of mindfulness was significantly related to fitness/exhaustion after controlling for other variables (*F*(6,43) = 10.103, $p \leq .001$, ΔR^2 = .158, *p*

< .01). The facets of acting with awareness and non-judging of experience were uniquely associated with fitness/exhaustion, while describing, neuroticism, and openness were not. Thus, in the case of fitness/exhaustion experienced by student-athletes, it appears that overlapping personality dimensions and several aspects of mindfulness are not highly predictive, whereas to be non-judging of experiences and acting with awareness are strongly negatively related to this aspect of stress in sport.

Additional Analyses

Perceptions of one's competitive performance are an important component of the sport experience for many student-athletes. Although the number of participants who responded to the SIPS (N = 17) allowed only an exploratory, peripheral analysis, it is worth highlighting some prospective relationships with this variable that may be of interest to future research.

First, the sample of participants who completed the SIPS was compared to those who did not, to check for any systematic differences between these two groups, and no significant differences were found with respect to any of the variables considered in this study. There were significant correlations between satisfaction with performance and socio-emotional stress (r = -.548, p < .05) and fitness/exhaustion (r = -.485, p < .05). Additionally, a multiple linear regression model using both types of stress to predict satisfaction with performance was statistically significant, $F(2,14) = 4.685$, $p < .05$, $R^2 = .401$, with medium beta weights attached to both socio-emotional stress (β = -.433, t = -1.965, p > .05, 95% CI [-1.850, .081]) and fitness/exhaustion (β = -.338, t = -1.534, p > .05, 95% CI [-2.407, .400]). Despite the low (41-60%) power due to the small sample, these results suggest that reductions in the types of stress considered in this study are associated prospectively with increased satisfaction with performance.

Discussion

The purpose of this study was to examine the stress recovery process of student-athletes over time, in relation to dispositional mindfulness. Although the study procedures yielded neither the sample size nor the stressful experiences required for this originally planned analysis, a focused analysis of the baseline data has produced new insights into mindfulness and stress in student-athletes.

The first of these insights relates to the component structure of the RESTQ-Sport. Within my sample, I identified two components that represent different types of stress experienced by student-athletes – socio-emotional stress and feelings of fitness/exhaustion surrounding practice or competition. While this structure appeared to be the most appropriate for my sample, I will note that this is a very similar structure to what was proposed by the original authors. Also, the relatively small sample of my study does not allow for a traditional component analysis at the item level. Such analyses have been completed by previous researchers (Davis IV et al., 2007; González-Boto et al., 2008; Kellmann & Kallus, 2001; Martinent et al., 2014; Nicolas et al., 2015), generally supporting the two-factor structure proposed by the original authors. Whether one chooses to adopt the given structure or form these components in a data-driven way in a given sample, the distinction appears to be quite important as the two components have distinct predictors.

The second insight relates to treating mindfulness as a unitary vs. a multi-faceted construct. The persistent relationship between neuroticism and socio-emotional stress has been found many times before (Gross et al., 1998; Gunthert et al., 1999; Zautra et al., 2005), as has the relationship between mindfulness and stress (K. W. Brown et al., 2012; Bullis et al., 2014; Creswell et al., 2014; Palmer & Rodger, 2009; Weinstein et al., 2009). Considering the close link

between mindfulness and neuroticism, the results of this study suggest that full-scale mindfulness may not be uniquely important to the types of stress measured here, among a sample of student-athletes. This interpretation should be considered cautiously, however, given the relatively small sample. The regression coefficient and 95% confidence interval associated with the mindfulness-fitness/exhaustion relationship is very close to the cut-off for significance, which is especially difficult to interpret either way in a small sample. Nonetheless, the present findings gave little if any support to the value of mindfulness as a unitary predictor of stress in student-athletes, distinct from well-known personality factors that are also easily measured.

The third insight is that certain facets of mindfulness, specifically acting with awareness and non-judging of experiences, are more useful predictors of fitness/exhaustion than is either neuroticism or full-scale mindfulness. This finding suggests a way to refine and enhance mindfulness-based interventions. Current mindfulness-based interventions understandably promote all facets of mindfulness. Interventions specifically targeted toward reducing stress related to fitness/exhaustion among athletes, however, may produce better results by emphasizing and spending more time on the facets that are most closely associated with this type of stress. For example, many MBSR programs include an activity called a “body scan”, where participants are encouraged to direct their awareness to different areas of their body and take note of the sensations they are experiencing. This activity aligns with the mindfulness facet of observing, which appears to be unrelated to the types of stress measured in this study. An MBSR intervention with student-athletes may allocate this time instead to encouraging athletes to be purposeful and deliberate with their strength training exercises, consistent with acting with awareness. Previous research may lend support to this approach, as non-judging and acting with awareness have been consistently found to be predictive of stress, anxiety, and depression

(Bergman, Christopher, & Bowen, 2016; D. B. Brown, Bravo, Roos, & Pearson, 2015; Cash & Whittingham, 2010; Desrosiers, Klemanski, & Nolen-Hoeksema, 2013; Soysa & Wilcomb, 2015), while relationships between other facets and these outcomes have been found on a less reliable basis. These studies have not involved student-athletes, however, making the present research unique in this way.

Future Directions

The limitations of this study present opportunities for further research. First, the cross-sectional nature of this study makes it impossible to establish cause-and-effect relationships. The findings of this study could be better explained by processes not accounted for in this research. For example, chronic stress may interfere with mindfulness, or the relationship between mindfulness and stress may be due to other stress-reduction measures, such as listening to music, spending time in nature, or spending time with family and friends.

Second, participants were not surveyed on the types of stress they experience. As student-athletes experience varied stressors, it is possible that other categories of stress such as academic stress, which is not included in the structure of the RESTQ-Sport, may be associated with mindfulness in different ways. Identifying and studying the different types of stress experienced by student-athletes may be beneficial in the design of intervention programs, for example by creating scripts or exercises specific to dealing with pressure from exams, or specifying certain times or occasions when an intervention may be most important or useful.

Acting with awareness refers to the intentioned execution of behaviours, as opposed to doing things “on auto-pilot”. This study found that acting with awareness has an equivocal relationship with the types of stress experienced by student-athletes. Specifically, we saw that this facet of mindfulness is not predictive of the general types of stress experienced by most

individuals, but is predictive of the types of stress unique to athletes. This suggests that acting with awareness is particularly meaningful in a sport context, and presents some interesting possibilities.

For the past two decades, sport research has studied the phenomenon of *flow*, described as "a state of consciousness where one becomes totally absorbed in what one is doing, to the exclusion of all other thoughts and emotions" (Jackson & Csikszentmihalyi, 1999, p. 5). Much of this research suggests that optimal athletic performance is often achieved during states of flow, times when an athlete's body is allowed to take over without interference from active thought (see Jackson, Thomas, Marsh, & Smethurst, 2001). In contrast, mindfulness includes remaining aware, noticing, and observing – the opposite of excluding thoughts and emotions. The existing body of literature in this area appears conflicted. Some studies have shown negative relationships between mindfulness and flow (Sheldon, Prentice, & Halusic, 2015). Other studies suggest a positive relationship between mindfulness, propensity to achieve flow states, and athletic performance (Cathcart, McGregor, & Groundwater, 2014), and mindfulness training for athletes as an effective method in increasing quantity of flow experiences (Aherne, Moran, & Lonsdale, 2011). Thus, the relationship between mindfulness and flow in a sport context warrants further exploration.

Finally, future research in this area may also consider other athlete sub-groups. Gender stereotypes have been shown to present an additional source of stress for female student-athletes, but not for male student-athletes (Kimball & Freysinger, 2003). Despite this difference, the focus of this study was how mindfulness relates to stress, not the specific stressors that different athletes face in sport. Therefore, there was no special consideration given to the gender of participants in this study, though future researchers may wish to consider distinctive stress

experiences with respect to gender. Some research has also identified that older adults (i.e., aged 60-80 years) scored higher on measures of both mindfulness and psychological well-being than a younger cohort (Hohaus & Spark, 2013). It would be interesting to examine if this pattern holds true among a population of athletes. Similarly, a recent comparison of group and individual MBCT interventions showed similar effectiveness in each condition (Schroevers, Tovote, Snippe, & Fleer, 2016). In this study, participants were randomly assigned to one condition or the other. In a sport context, however, there would likely be greater group cohesion due to the amount of time spent together and the common goals associated with their sport. A study comparing the effectiveness of a mindfulness-based intervention for athletes in individual sports (e.g., golf, archery, figure skating) relative to athletes in team or team-training sports (e.g., basketball, swimming, cycling) may reveal the value of group cohesion in enhancing intervention effectiveness.

The results of this study, if replicated with a much larger sample, would be of interest to athletes and coaches. When disseminating these results and implementing interventions for student-athletes, it may be valuable to emphasize the holistic nature of experiences in sport. As discussed, student-athletes face many sources of stress which may be alleviated by an effective intervention program. Participant buy-in may be strengthened by conveying to athletes and coaches that a stress-reduction intervention could provide benefits not just for competitive performance but for many areas of a student-athlete's life.

Conclusion

The results of this study are meaningful for a few reasons. First, they serve to illustrate the situations in which it may be useful to incorporate a measure of mindfulness into an assessment of athletes' stress levels, and when measuring neuroticism alone may be a more

efficient method. Considering the many demands that athletes face (the very demands that cause stress in the first place), adopting methods of assessment that are minimally invasive to their schedules is a valuable goal.

The results of this study highlight the relationship between mindfulness and stress among collegiate student-athletes, showing that the facets of non-judging and acting with awareness are especially important to predicting the negative feelings that are also unique to training and competition experiences in sport. This study contributes to the existing body of literature by examining dispositional mindfulness within a sport context and studying unique facets of mindfulness with relation to different types of stress. A better understanding of these relationships may help to inform the development and specialization of mindfulness-based stress reduction interventions for athletes, while providing coaches with individualized information about how to best monitor and support their athletes.

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Appendix A

FFMQ-15: 15-item Five-Facet Mindfulness Questionnaire

Instructions

Please use the 1 (never or very rarely true) to 5 (very often or always true) scale provided to indicate how true the below statements are of you. Circle the number in the box to the right of each statement which represents your own opinion of what is generally true for you. For example, if you think that a statement is often true of you, circle '4' and if you think a statement is sometimes true of you, circle '3'.

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1. When I take a shower or a bath, I stay alert to the sensations of water on my body.	1	2	3	4	5
2. I'm good at finding words to describe my feelings.	1	2	3	4	5
3. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	1	2	3	4	5
4. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	1	2	3	4	5
5. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	1	2	3	4	5
6. I notice how foods and drinks affect my thoughts, bodily sensation, and emotions.	1	2	3	4	5
7. I have trouble thinking of the right words to express how I feel about things.	1	2	3	4	5
8. I do jobs or tasks automatically without being aware of what I'm doing.	1	2	3	4	5
9. I think some of my emotions are bad or inappropriate and I shouldn't feel them.	1	2	3	4	5

10. When I have distressing thoughts or images I am able just to notice them without reacting.	1	2	3	4	5
11. I pay attention to sensations, such as the wind in my hair or sun on my face.	1	2	3	4	5
12. Even when I'm feeling terribly upset I can find a way to put it into words.	1	2	3	4	5
13. I find myself doing things without paying attention.	1	2	3	4	5
14. I tell myself I shouldn't be feeling the way I'm feeling.	1	2	3	4	5
15. When I have distressing thoughts or images I just notice them and let them go.	1	2	3	4	5

Scoring Information

Observing items: 1, 6, 11
Describe items: 2, 7R, 12
Acting with awareness items: 3R, 8R, 13R
Non-judging items: 4R, 9R, 14R
Non-reactivity items: 5, 10, 15

Reverse-phrased items are denoted by 'R' after the item number, e.g., 14R

Gu, J., Strauss, C., Crane, C., Barnhofer, T., Karl, A., Cavanagh, K., & Kuyken, W. (2016). Examining the factor structure of the 39-item and 15-item versions of the Five Facet Mindfulness Questionnaire before and after mindfulness-based cognitive therapy for people with recurrent depression. *Psychological Assessment, 28*(7), 791–802. https://doi.org/http://dx.doi.org/10.1037/pas0000263

Appendix B

Scales of the RESTQ-Sport

Dimension (number of scales)	Scale (Description)
General stress (7 scales)	1 – General Stress (Unspecific strain reactions) 2 – Emotional Stress (Anxiety, inhibitions and anger) 3 – Social Stress (Frequency of arguments, fights, irritation concerning others and being upset) 4 – Conflicts/Pressure (Unsettled conflicts, unpleasant things and repetitive thoughts) 5 – Fatigue (Disturbed work, overfatigue and overcharge) 6 – Lack of Energy (Deficiency in concentration, energy and decision-making) 7 – Somatic Complaints (Physical indisposition and physical complaints)
General recovery (5 scales	8 – Success (Success related to performance in general) 9 – Social Relaxation (Frequency of pleasurable social contacts, change combined with relaxation and amusement) 10 – Somatic Relaxation (Physical relaxation and fitness) 11 – General Well-being (Frequency of good mood and high level of well-being) 12 – Sleep (Trouble in falling asleep and interrupted sleep)
Specific stress (3 scales)	13 – Disturbed breaks (Defective recovery, pauses disturbed by situational aspects including other people) 14 – Burnout/Emotional exhaustion (Burnout, desire to quit) 15 – Fitness/Injury (Acute injury or vulnerability to injuries)
Specific recovery (4 scales)	16 – Fitness/Being in Shape (Fitness, physical efficiency and vitality) 17 – Burnout/Personal Accomplishment (Feeling of integration in a team, good communication with teammates and enjoyment in daily activities) 18 – Self-efficacy (Feeling of being well trained and optimally prepared) 19 – Self-regulation (Use of mental skills to prepare, push, motivate and set goals

Adapted from "Recovery-Stress Questionnaire for Athletes: User Manual," by M. Kellmann and K. W. Kallus, 2001, Champaign IL: Human Kinetics.

Appendix C

RESTQ-26 Sport

This questionnaire consists of a series of statements. These statements possibly describe your psychological or physical well-being or your activities during the past few days and nights.

Please select the answer that most accurately reflects your thoughts and activities. Indicate how often each statement was right in your case in the past days.

The statements related to performance should refer to performance during competition as well as during practice.

For each statement there are seven possible answers.

Please make your selection by marking the number corresponding to the appropriate answer.

Example:

In the past (3) days/nights

… I read a newspaper

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

In this example, the number 5 is marked. This means that you read a newspaper very often in the past three days.

Please do not leave any statements blank.

If you are unsure which answer to choose, select the one that most closely applies to you.

Please turn the page and respond to the statements in order without interruption.

In the past (3) days/nights

1) … *I was in a bad mood*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

2) *... I had difficulties in concentrating*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

3) *... I worried about unresolved problems*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

4) *... I had a headache*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

5) *... I was dead tired after work*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

6) *... I felt uncomfortable*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

7) *...I was annoyed by others*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

8) ... *I felt down*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

9) ... *I was fed up with everything*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

10) ... *I was overtired*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

11) ... *I was annoyed*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

12) ... *I was upset*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

13) ... *I put off making decisions*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

14) ... *I felt under pressure*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

15) ... *parts of my body were aching*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

16) ... *I could not get rest during the breaks*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

17) ... *I felt burned out by my sport*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

18) ... *my muscles felt stiff or tense during performance*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

19) ... *I had the impression there were too few breaks*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

20) ... *I felt emotionally drained from performance*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

21) ... *I had muscle pain after performance*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

22) ... *too much was demanded of me during the breaks*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

23) ... *I felt that I wanted to quit my sport*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

24) ... *the breaks were not at the right times*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

25) ... *I felt vulnerable to injuries*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

26) ... *I felt frustrated by my sport*

0	1	2	3	4	5	6
Never	Seldom	Sometimes	Often	More often	Very often	Always

Adapted from “Recovery-Stress Questionnaire for Athletes: User Manual,” by M. Kellmann and K. W. Kallus, 2001, Champaign IL: Human Kinetics.

Appendix D

Ten-Item Personality Inventory-(TIPI)

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

I see myself as:

1. _____ Extraverted, enthusiastic.

2. _____ Critical, quarrelsome.

3. _____ Dependable, self-disciplined.

4. _____ Anxious, easily upset.

5. _____ Open to new experiences, complex.

6. _____ Reserved, quiet.

7. _____ Sympathetic, warm.

8. _____ Disorganized, careless.

9. _____ Calm, emotionally stable.

10. _____ Conventional, uncreative.

TIPI scale scoring ("R" denotes reverse-scored items):

Extraversion: 1, 6R; Agreeableness: 2R, 7; Conscientiousness; 3, 8R; Emotional Stability: 4R, 9;

Openness to Experiences: 5, 10R.

Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*(6), 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1

Appendix E

Recovery Cue Inventory

1. **How much effort was required to complete my workout(s) yesterday?**

Excessive effort *Hardly any effort*
0 1 2 3 4 5 6

2. **How recovered did I feel before my workout(s) yesterday?**

Still not recovered *Energized & recharged*
0 1 2 3 4 5 6

3. **How successful was I at rest and recovery activities yesterday?**

Not successful *Successful*
0 1 2 3 4 5 6

4. **How well did I recover physically yesterday?**

Never *Always*
0 1 2 3 4 5 6

5. **How satisfied and relaxed was I as I fell asleep yesterday?**

Never *Always*
0 1 2 3 4 5 6

6. **How much fun did I have yesterday?**

Never *Always*
0 1 2 3 4 5 6

7. **How convinced was I that I could achieve my goals during performance yesterday?**

Never *Always*
0 1 2 3 4 5 6

Kellmann, M., Patrick, T., Botterill, C., & Wilson, C. (2002). The Recovery-Cue and Its Use in Applied Settings: Practical Suggestions Regarding Assessment and Monitoring of Recovery. In M. Kellman (Ed.), *Enhancing Recovery: Preventing Underperformance in Athletes* (pp. 219–232). Windsor, ON: Human Kinetics.

Appendix F

Single-Item Performance Scale

On a scale from *0 (Poor)* to *10 (Excellent)*, how would you rate the quality of your athletic performance?

Poor					Mediocre					Excellent
0	1	2	3	4	5	6	7	8	9	10

Appendix G

Informed Consent Form

Research Project Title: Student-Athlete Experiences

Principal Investigator:
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This research is supported by the Social Sciences and Humanities Research Council of Canada (SSHRC), the University of Manitoba Faculty of Graduate Studies, and the Government of Manitoba.

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.

*What **Will** Be Asked of You*

- At or near the beginning of your competition season, complete two surveys (approximately 10 minutes total)
- One week prior to a major competition or event, complete one survey (approximately 5 minutes)
- Every day for two weeks after the major competition or event, complete one very brief survey (approximately 2-3 minutes at the end of each day)

All questionnaires will be made available via an online, mobile-friendly survey system.

*What **Will Not** Be Asked of You*

- Data will not be collected during your competition
- You will not have to visit a lab setting
- You will not have to perform any physical tasks

- You will not be asked to share any information with your teammates, coaches, trainers, or other staff

The purpose of this research is to study personality and emotional experiences in sport. You are being asked to participate as a University student-athlete. The long-term goal of this research is to provide athletes and coaches with tools to create more personalized stress management plans in sport.

Confidentiality
The nature of this research requires that we be able to connect your individual responses at one time to responses at another time while the data are being collected. For this reason, you will be asked to provide your name and student number. This information will be kept confidential. Once the data are collected, your name and student number will be replaced by an arbitrary number. This will break the link between your identifying information and the data you provide. Electronic data will be stored on a private laptop computer, protected by a minimum of two (2) passwords.

Confidential data will be kept only until it is no longer necessary for data analysis, no later than May 2018. Electronic data will be erased and physical data (with the exception of the Informed Consent form) will be confidentially shredded. Anonymous data (that has no individual identifying characteristics) will be kept indefinitely.

It is important for you to know that individual results from these surveys will never be shared, not even with coaches and athletic staff. As a result, and because the data will be anonymous, you can be completely open and honest in how you complete these surveys.

Risks and Benefits
While participants will not receive any direct benefits from participating in this study, the aim will be to provide coaches and supporting team staff with knowledge that can facilitate and speed future stress recovery.

You will not receive any direct credit or remuneration for participating in this research. You may withdraw from the study at any time without penalty.

Participating in this study will involve you remembering potentially stressful experiences in your life. While this would not be anything beyond what is normal for everyday activities, it is possible that it may cause you some emotional distress. The University of Manitoba offers different services to help cope with such distress. Should you feel like you want assistance in this process, please contact one of the following resources:

University of Manitoba Student Counselling Centre
474 University Centre, University of Manitoba
(204) 474-8592

University of Manitoba Psychological Service Centre
161 Dafoe Bldg, University of Manitoba

(204) 474-9222
psc@umanitoba.ca

Results
Results from this study will be shared only in aggregate form – no individual information will ever be shared. Also, coaches and other staff will not be made aware of who agreed or did not agree to participate in this research at any time. After the study is completed (projected for May 2018), results will be made available to University of Manitoba coaches to help them provide the best programming for their athletes. Results will also be shared in academic settings, such as publication in research journals, conference presentations, and similar avenues, and a summary of the results will be made available to you. If you would like to receive such a summary, please circle your preferred method of communication and provide the appropriate contact information at the end of this form.

Thank you for your interest in this study. By participating, you are helping contribute to our understanding of the factors that influence recovery from stressful experiences in sport.

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.
This research has been approved by the Psychology/Sociology 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 at 204-474-7122 or humanethics@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Name (please print): ______________________________________

Signature ____________________________________ Date _____________________

E-mail ______________________________________

- -

I would like to receive a summary of this study's results by May 2018 via: E-mail / Mail

E-mail:

_____

Mailing Address:

_____

_____

_____

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