Sport Perfectionism and Risk Factors of Sport Injury Rehabilitation Overadherence

A Thesis Presented to the School of Kinesiology

Lakehead University

Kristi MacWilliam

Supervisor: Dr. John Gotwals

Thesis Committee: Dr. Paolo Sanzo and Leanne Smith

Acknowledgements

I would like to thank all of the people that have helped to make this thesis a reality.

First and foremost, thank you to my supervisor, Dr. John Gotwals. It has been a pleasure working with you over the last few years throughout both my master's and my undergraduate thesis. Thank you for pushing me to do my best and figure things out on my own, but also for pointing me in the right direction when I needed it. You helped me to get so much more out of this experience than just a degree, and for that I am extremely grateful.

Thank you to my committee members, Dr. Paolo Sanzo and Leanne Smith. Your expertise, guidance, and assistance with recruitment has been invaluable.

A big thank you to all of the athletes who took the time to participate and make the most out of an unfortunate situation by contributing to this study. I wish you all a speedy recovery!

Participant recruitment was a challenging journey and I couldn't have done it without all of the help I received. A special thanks to Alignment Chiropractic & Rehab, Lakehead Athletics, Thrive Strength and Wellness, Victoriaville Physiotherapy Centre, and Kyle McGillivray for going above and beyond to help me find participants.

Thank you to my friends and fellow graduate students who filled the last two years with fun, excitement, and laughter. Jacqueline, thank you for being my role model and teaching me the art of balancing work with adventure. Bailey, Mica, and Lily: thank you for being my family away from home.

Finally, thank you to my family for your endless support. Thank you to my mom and step-dad, Kim and Dave, for trying to whisk me away from school every chance that they got. Thank you to my dad, Howie, for making light of every situation. Thank you to my brother, Braden, for always believing in me. Thank you to my grandparents, Judy and Ron, and my uncle, Craig, for endlessly trying to figure out what I'm studying in school.

This has been an extremely challenging and yet rewarding experience and I couldn't have done it without all of you.

Abstract

Rehabilitation overadherence is a form of nonadherence in which individuals exceed practitioners' guidelines regarding the rehabilitation of their injury, resulting in enhanced risk for re-injury and prolonged recovery (Granquist, Podlog, Engel, & Newland, 2014). Overadherence is common among overly-motivated injured athletes with intense personalities (Niven, 2007). This suggests that perfectionism may be a factor that puts injured athletes at a greater risk of rehabilitation overadherence. This study utilized the 2×2 model of perfectionism (Gaudreau & Thomspon, 2010) to investigate this claim. Injured athletes ($N = 82$; Mage = 27.45 years, $SD = 10.88$) currently undergoing supervised rehabilitation completed measures of two perfectionism dimensions (personal standards and evaluative concerns) and four overadherence risk factors (Effortful Healing, Expedited Rehabilitation, Inclinations to Overadhere, and Normalization of pain). A series of multiple regression analyses tested whether the perfectionism dimensions interacted to predict each overadherence risk factor. No significant effects were found for Effortful Healing and Expedited Rehabilitation. A significant main effect ($\beta = 0.17$) indicated that higher levels of evaluative concerns predicted greater Inclinations to Overadhere. A significant interaction effect ($\beta = -0.07$) identified a similar relationship between evaluative concerns and Normalization of Pain, but specified that this relationship was greatest when personal standards were low. Findings are interpreted in line with the 2×2 model's hypotheses and identified initial evidence of the associations between perfectionism and sport injury rehabilitation overadherence. The discussion speculates as to why relationships were evident for some overadherence risk factors, but not others, elaborates on the role of evaluative concerns perfectionism in overadherence, and suggests practical implications for practitioners.

Table of Contents

List of Tables

List of Figures

List of Appendices

Sport Perfectionism and Risk Factors of Sport Injury Rehabilitation Overadherence

The process of sport injury rehabilitation can be very stressful for athletes (Brewer, 2010). Some athletes respond to this stress by overdoing practitioner recommendations, or overadhering to their injury rehabilitation (Granquist, Podlog, Engel, & Newland, 2014; Niven, 2007). Rehabilitation overadherence consists of overdoing prescribed rehabilitation activities and/or failing to comply with recommended activity-related restrictions (Granquist et al., 2014; Niven, 2007). Athletes might perform prescribed exercises to a greater frequency or intensity than recommended, perform extra exercises, or disregard activity restrictions in their rehabilitation and attempt to return to sport before they are physically and psychologically ready to do so (Bianco, 2001; Granquist et al., 2014; Niven, 2007; Podlog et al., 2013). Such behaviours could be detrimental to the well-being of injured athletes and could result in re-injury, rehabilitation setbacks, and, as a result, a prolonged recovery (Granquist et al., 2014; Niven, 2007).

To help prevent the negative consequences of rehabilitation overadherence, it would be valuable to identify factors that encourage injured athletes to overadhere. It might be particularly valuable to explore the role of personality factors, since personality likely plays a vital role in adherence behaviours (Niven, 2007). More specifically, overly motivated (Granquist et al., 2013; Niven, 2007) athletes with "intense" (Niven, 2007, p. 101) personalities are at risk to overadhere. This suggests that sport perfectionism could be a factor that puts athletes at a greater risk of rehabilitation overadherence. Perfectionism is encouraged in sport contexts and prevalent among competitive athletes, yet also puts athletes at risk for injury (Gould, Dieffenbach, & Moffett, 2002; Madigan, Stoeber, Forsdyke, Dayson, & Passfield, 2017). This idea is further supported by claims that even when injured, perfectionists might still be motivated to strive for high standards

of sport performance (Flett & Hewitt, 2014). Only two studies have directly examined rehabilitation overadherence (Hilliard, Blom, Hankemeier, & Bolin, 2016; Podlog et al., 2013) and neither have focused on the relationship between rehabilitation overadherence and perfectionism. The general purpose of this study is to examine the role of sport perfectionism as a predictor of rehabilitation overadherence.

Sport Injury Rehabilitation Overadherence

   Evolution of rehabilitation overadherence research. Research on rehabilitation overadherence just recently emerged from research examining athletes' general adherence behaviours and tendencies. Research examining factors that impact adherence is important, given that following practitioner recommendations is essential for efficient and successful physical and psychological recovery from sport injury (Bassett & Prapavessis, 2007; Levy, Polman, & Clough, 2008; Niven, 2007). Despite this, rehabilitation practitioners perceive that more often than not, injured athletes do not follow professional recommendations during their rehabilitation (Granquist et al., 2014; Niven, 2007). Such nonadherence is typically studied in the form of underadherence, or doing too little in terms of rehabilitation. An evolving line of research, however, suggests that overadherence, or overdoing practitioner recommendations, may be an understudied form of nonadherence that is particularly salient among athletes (Granquist et al., 2014; Hilliard et al., 2016; Niven, 2007; Podlog et al., 2013).

   Rehabilitation overadherence was first mentioned in qualitative research that explored practitioners' general perspectives on injured athletes' adherence to rehabilitation (Granquist et al., 2014; Niven, 2007). Niven (2007) interviewed nine sports physiotherapists about their perceptions and experiences regarding injured athletes' adherence to sport injury rehabilitation. These physiotherapists consistently reported overadherence to be an issue, particularly among

extremely motivated athletes who were eager to return to sport. Niven (2007) indicated that these behaviours could have severe consequences to athletes. Similarly, Granquist et al. (2014) used a mixed-methods approach to explore 479 athletic trainers' perspectives and experiences with injured athletes' adherence to sport injury rehabilitation in an athletic training setting. Participants completed an online questionnaire consisting of three questions related to adherence, each followed by a section for open-ended comments. The majority of these athletic therapists (97.9%) perceived overadherence to be an issue and suggested that some athletes might fail to comply with restrictions or do more than was prescribed in an attempt to accelerate the rehabilitation process. Similar to Niven, Granquist et al. emphasized the negative role that overadherence behaviours could play in the rehabilitation of athletes.

Given the consistent reports of its occurrence and potentially dangerous consequences, two studies directly examined overadherence in injured athletes (Hilliard et al., 2016; Podlog et al., 2013). In a two-part study, Podlog et al. (2013) quantitatively examined relationships between rehabilitation overadherence and two predictors (i.e., athletic identity and self-presentational concerns) among 118 injured adolescent athletes and 105 injured collegiate athletes. Hilliard et al. (2016) followed up this study with a mixed-methods approach to explore the relationship between athletic identity and rehabilitation overadherence among 80 currently injured collegiate athletes. These studies did not focus on the actual degree to which injured athletes overadhere (Hilliard et al., 2016; Podlog et al., 2013). Instead, they defined overadherence as "behaviours and underlying beliefs of athletes who engage in rehabilitation efforts that exceed practitioner-recommended guidelines" (Podlog et al., 2013, p. 372). The next sub-section discusses factors that could put injured athletes at a greater risk for rehabilitation overadherence.

Risk factors of rehabilitation overadherence. There are two interconnected risk factors that might explain why injured athletes' tend to exceed practitioner recommendations during rehabilitation. The first is being overly motivated to return to sport (Hilliard et al., 2016; Podlog & Eklund, 2007). The primary reason that athletes report adhering to injury rehabilitation is out of a desire to return to sport (Hilliard et al., 2016). Athletes who overadhere might be especially motivated to do so out of an intrinsic desire to return to sport. Injury limits or completely restricts athletes' abilities to participate in the sport that they enjoy and have invested so much time in, strips them from their athletic role and regular routine, and socially isolates them from their teammates and coaches (Hilliard et al., 2016; Mosewich, Crocker, & Kowalski, 2013). There might also be motivation to return to sport for more external reasons. Injured athletes might feel like they are letting down their team and perceive pressure to return from coaches and teammates (Bianco, 2001; Podlog & Eklund, 2005; Podlog, Dimmock, & Miller, 2011). Injured athletes might therefore be inspired to expedite their rehabilitation to facilitate an earlier return to sport, whether it is out of an intrinsic desire to fill the void of sport, or a result of external pressures to return (Podlog & Eklund, 2006). Excessive motivation and overly demanding pressures to return to sport could put athletes at greater risk to overcommit to their rehabilitation by doing more exercises than recommended and disregarding recommendations to restrict certain activities in an effort to return to sport sooner.

A second factor that puts injured athletes at a greater risk for overadherence is that they may strongly identify with, and behave in accordance to, the norms and values of sport (Hilliard et al., 2016; Podlog & Eklund, 2007). The dominant sport ethic emphasizes giving it your all, doing whatever it takes to win, and sacrificing short-term well-being to benefit long-term success (Frey, 1991). As such, efforts to push through pain and compete while injured are considered to

be just a normal "part of the game" and are admirable traits considered necessary to succeed in sport (Curry, 1993; Frey, 1991, p. 142). Because endorsing these behaviours is rewarded within the contexts of sport training and competition, it is not surprising that, when injured, athletes are likely to transfer these behaviours to their rehabilitation. Some injured athletes specifically express beliefs that they would return to sport sooner if they put more effort into their rehabilitation (e.g., "The more committed [I am] to my program, the quicker I'll return"; Hilliard et al., 2016, p. 215). That is, athletes may be more likely to overadhere to their rehabilitation when they demonstrate willingness to do whatever it takes to succeed in sport, believe that pushing through excessive pain is normal, and believe that more effort is indicative of better rehabilitation outcomes.

Personality plays an important role in influencing the way that injured athletes behave in their rehabilitation and it may be particularly influential in predicting risk factors of rehabilitation overadherence (Granquist et al., 2014; Hilliard et al., 2016; Podlog et al., 2013; Wiese-Bjornstal et al., 1998). In particular, injured athletes with extreme personalities that lead them to be overly motivated and to have abnormally high or unrealistic expectations in their rehabilitation may be more likely to overadhere (Granquist et al., 2014; Niven, 2007). These characteristics align well with the personality trait of perfectionism. Perfectionism is also common among competitive athletes (Gould et al., 2002) and has been found to predispose athletes to injury (Madigan, Stoeber, Forsdyke, Dayson, & Passfield, 2017). As a result, perfectionism may be particularly prevalent among injured athletes (Flett & Hewitt, 2014; Gould et al., 2002; Madigan, Stoeber, Forsdyke et al., 2017). Collectively, this suggests that perfectionism may be an important risk factor to consider in the prediction of sport injury rehabilitation overadherence.

Perfectionism

Perfectionism is a multidimensional personality trait that is broadly defined by tendencies to set and strive for exceedingly high standards of performance, often accompanied by self-oriented and socially-prescribed tendencies to be overly critical of whether those standards are being met (Flett & Hewitt, 2002). Perfectionism in sport is characterized by ever-increasing achievement standards, an obsessive commitment to always improving, rigid and dichotomous thinking, recurring dissatisfaction in performance, and overstriving for perfection (Flett & Hewitt, 2014; Hill, Witcher, Gotwals, & Leyland, 2015). Although these characteristics are often viewed positively as being necessary for athletic success, they can also have negative consequences because of motivational difficulties and pressures to reach certain standards and expectations (Flett & Hewitt, 2005; Hill, Witcher et al., 2015). A rigid striving for perfection may be particularly detrimental in the imperfect world of injury rehabilitation, which involves unpredictable fluctuations of progress and unforeseen setbacks, creating a discrepancy between perfectionists' desired standards for achievement and their current capabilities (Flett & Hewitt, 2014; Gilbourne & Taylor, 1998; Mosewich et al., 2013). As a result, perfectionists may be particularly sensitive to the stresses of rehabilitation. Perfectionists characteristically view hard work as a means of achieving goals and cope with stress by expending efforts towards directly combatting the stressor and fixing the problem (Gotwals & Spencer-Cavaliere, 2014). It is likely then, that perfectionistic athletes might combat the stress of injury rehabilitation by *overstriving* (Flett & Hewitt, 2014), or in other words, *overadhering*, to recommended protocols.

2 × 2 model of perfectionism. Perfectionism is best conceptualized as a multidimensional construct (Gotwals, 2016) consisting of two overarching dimensions: personal standards perfectionism and evaluative concerns perfectionism. Personal standards perfectionism

encompasses tendencies to strive for perfection and to set exceedingly high standards of performance (Gaudreau & Antl, 2008). On the other hand, evaluative concerns perfectionism encompasses tendencies to be overly concerned about imperfection, to fear negative evaluation from others, to chronically perceive discrepancies between personal expectations and actual performance, and to doubt abilities to meet self-oriented and socially-prescribed standards (Gaudreau & Antl, 2008). It is important to distinguish between these two dimensions for a couple of reasons. First, the dimensions of perfectionism are said to result in different and often opposing associations, where personal standards perfectionism is often associated with more positive outcomes as compared to evaluative concerns perfectionism (Stoeber & Otto, 2006). Second, the dimensions are proposed to coexist to varying degrees in all individuals with different profiles across the two dimensions associated with different outcomes (Gaudreau & Thompson, 2010). As a result, it is important to examine if and how the two dimensions interact in the prediction of cognition, affect, and behaviour (Gaudreau & Thompson, 2010).

The 2 × 2 model of perfectionism (Figure 1; Gaudreau & Thompson, 2010) provides a theoretical framework to test the within-person combinations of personal standards perfectionism and evaluative concerns perfectionism. The model presents four unique perfectionistic subtypes that describe different "ways of being a perfectionist" (Gaudreau, 2016, p. 175). Non-perfectionism consists of low personal standards perfectionism with low evaluative concerns perfectionism. This is a neutral subtype in which athletes lack motivation to strive for perfection and are unconcerned over their achievement standards (Gaudreau, 2016; Gaudreau & Thompson, 2010). Pure personal standards perfectionism is a combination of high personal standards perfectionism with low evaluative concerns perfectionism. This subtype is characterized as an internalized form of perfectionism in which individuals take a reasonable and flexible approach

to striving for high performance standards, accept the inevitability of mistakes, and separate self-worth from performance (Gotwals & Spencer-Cavaliere, 2014; Hamachek, 1978; Lundh, 2004). Pure evaluative concerns perfectionism is a combination of low personal standards perfectionism with high evaluative concerns perfectionism. This subtype is characterized as an externalized form of perfectionism in which individuals perceive external pressures to reach unrealistically high standards that are perceived to be imposed by significant others, without personally valuing those standards (Gaudreau & Thompson, 2010). Lastly, mixed perfectionism is a combination of high personal standards perfectionism with high evaluative concerns perfectionism. Mixed perfectionism is characterized as a partially internalized form of perfectionism in which personal morals and values align with external pressures to reach excessively high performance standards (Gaudreau & Thompson, 2010; Hamachek, 1978).
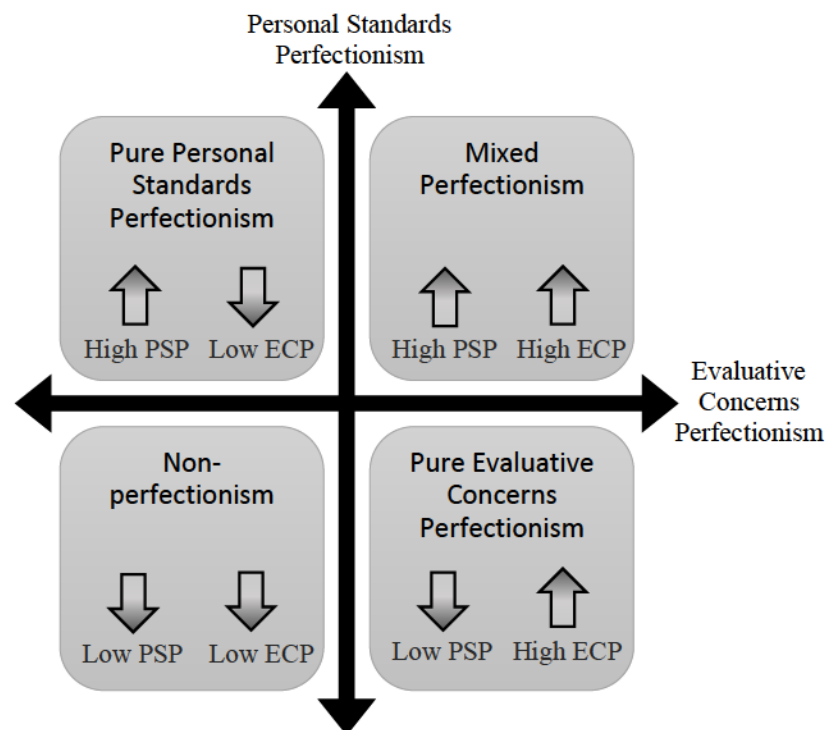
Figure 1. The 2 × 2 Model of Perfectionism (Gaudreau & Thompson, 2010).

In line with these characteristics, the 2 × 2 model proposes four hypotheses for the suggested outcomes of each subtype. Hypothesis 1 compares non-perfectionism and pure personal standards perfectionism and examines whether pure personal standards perfectionism is associated with better (Hypothesis 1a), worse (1b), or equivalent (1c) outcomes as compared to non-perfectionism. This hypothesis addresses current controversy over whether perfectionism is solely maladaptive or whether aspects of perfectionism contain healthy, adaptive characteristics (Hill, 2016). Hypothesis 1c has received some criticism, however, as it encourages the interpretation of non-significant results (Stoeber, 2012). In order to address this, it is recommended that non-significant findings be interpreted as inconclusive, rather than as support for Hypothesis 1c (Gaudreau, Franche, Kljajic, & Martinelli, 2017). Testing of Hypothesis 1 will then help to illuminate under what conditions pure personal standards perfectionism leads to better or worse outcomes compared to non-perfectionism (Gaudreau et al., 2017). Gaudreau et al. (2017) propose that pure personal standards perfectionism is more susceptible to environmental influences as compared to non-perfectionism. Under normal circumstances, pure personal standards perfectionism is thought to typically lead to better outcomes than non-perfectionism (supporting Hypothesis 1a). Under stressful conditions or adverse environments, pure personal standards perfectionism may be associated with worse outcomes compared to non-perfectionism (supporting Hypothesis 1b).

The remaining three hypotheses are more straightforward. Hypothesis 2 compares non-perfectionism and pure evaluative concerns perfectionism and posits that non-perfectionism is associated with better outcomes than pure evaluative concerns perfectionism. This hypothesis tests whether the presence of evaluative concerns in pure evaluative concerns perfectionism will lead to maladaptive outcomes. Hypothesis 3 compares mixed perfectionism and pure evaluative

concerns perfectionism and posits that mixed perfectionism will lead to better outcomes as compared to pure evaluative concerns perfectionism. This hypothesis tests whether the generally positive influence of high personal standards offer a protective effect that buffers the negative influence of evaluative concerns. Hypothesis 4 compares pure personal standards perfectionism with mixed perfectionism and posits that pure personal standards perfectionism will be associated with better outcomes than mixed perfectionism. This hypothesis examines whether the relative absence of evaluative concerns perfectionism in pure personal standards perfectionism compared to mixed perfectionism will lead to more positive outcomes (Gaudreau & Thompson, 2010).

Research Supporting the Perfectionism-Overadherence Relationship

No research has directly examined the relationship between perfectionism and sport injury rehabilitation overadherence. There are two bodies of literature, however, that can provide an indication as to how these constructs are related. One is qualitative research examining the core features and characteristics of perfectionism in sport (Gotwals & Spencer-Cavaliere, 2014; Hill, Witcher et al., 2015). A second relevant body of literature is research linking perfectionism with overstriving in contexts outside of injury rehabilitation (Hill, Robson, & Stamp, 2015; Madigan, Hill, Anstiss, Mallinson-Howard, & Kumar, in press). The subsequent sections describe how findings from these two bodies of literature translate to a sport injury rehabilitation context, providing evidence to how perfectionism might predict rehabilitation overadherence.

Core characteristics of perfectionism. Four studies have used qualitative methods to explore how perfectionistic athletes characteristically behave, providing evidence as to how they might behave in a sport injury rehabilitation context. Hill, Witcher et al. (2015) interviewed 15 athletes, dancers, and musicians who self-identified as perfectionists to explore the defining

features of perfectionism in sport. Sellars, Evans, and Thomas (2016) interviewed 10 elite athletes who were mixed perfectionists to explore their sport experiences. Gotwals and Spencer-Cavaliere (2014) interviewed 18 intercollegiate athletes to explore perspectives on achievement in sport between two different types of perfectionists: pure personal standards perfectionists and mixed perfectionists. Lastly, Mallinson-Howard, Knight, Hill, and Hall (2018) conducted focus groups and individual interviews with 19 female adolescent athletes to explore the differences in youth sport experiences associated between the four subtypes of the 2 × 2 model.

Taken together, the core characteristics of perfectionism defined by these studies shed light on how perfectionism might be related to rehabilitation overadherence. One core characteristic of particular interest is effort. Perfectionists demonstrate an unwavering and obsessive commitment to always progress, are rarely satisfied with performance, and, after reaching a goal, only want to push themselves further (Gotwals & Spencer-Cavaliere, 2014; Hill, Witcher et al., 2015; Sellars et al., 2016). Furthermore, perfectionists have difficulties with disengaging from a pursuit of athletic goals, regardless of potentially negative consequences (Hill, Witcher et al., 2015; Sellars et al., 2016). Another core characteristic is a self-worth that is contingent on attaining high standards in sport. Specifically, some perfectionists attribute who they are as a person to the outcome of their sport performance and have lower self-confidence if they fall short of certain standards in sport (Gotwals & Spencer-Cavaliere, 2014; Sellars et al., 2016). A final core characteristic of perfectionism is a susceptibility to external pressures to reach high standards of performance. Perfectionists experience anxieties and pressures from coaches, teammates, parents, and opponents to constantly improve; and express concerns about letting down the team (Hill, Witcher et al., 2015; Sellars et al., 2016). As a result of these characteristics, perfectionists might also demonstrate excessive effort and an inability to

disengage from athletic pursuits during sport injury rehabilitation, sacrifice their well-being to return to sport and satisfy their self-worth, and give in to external pressures to return to sport after injury, putting them at a greater risk for overadherence.

These core characteristics are not represented equally across all subtypes of perfectionism. Effort is a characteristic that is consistent among subtypes, apart from non-perfectionism (Gotwals & Spencer-Cavaliere, 2014; Hill, Witcher et al., 2015; Mallinson-Howard et al., 2018; Sellars et al., 2016), but the subtypes may differ on how they view effort. Pure personal standards perfectionists tend to set reasonable goals and expectations as compared to pure evaluative concerns and mixed perfectionists (Gotwals & Spencer-Cavaliere, 2014; Mallinson-Howard et al., 2018). Furthermore, pure evaluative concerns and mixed perfectionists are more self-critical when they experience setbacks, express concerns over letting down teammates, and are more susceptible to external pressures and concerns over letting others down as compared to pure personal standards and non-perfectionists (Gotwals & Spencer-Cavaliere, 2014; Mallinson-Howard et al., 2018). Pure evaluative concerns perfectionists might be even more susceptible to external pressures as compared to mixed perfectionists, given that the subtype is characterized as an externalized form of perfectionism in which athletes are motivated by external pressures to reach high standards in sport (Gaudreau & Thompson, 2010).

Based on these findings from the qualitative literature, some subtypes of perfectionism may demonstrate a healthy striving towards sport injury rehabilitation, while some might be overly motivated to return to sport, putting them at a greater risk to overadhere. The core characteristics of the subtypes can be summarized and interpreted using the 2×2 model as a conceptual framework. Given that pure personal standards and pure evaluative concerns perfectionists both exert effort towards sport achievement (Gotwals & Spencer-Cavaliere, 2014;

Hill, Witcher et al., 2015; Mallinson-Howard et al., 2018; Sellars et al., 2016), these subtypes are likely at a greater risk to demonstrate excessive efforts in their sport injury rehabilitation as compared to non-perfectionists (supporting Hypotheses 1b and 2 of the 2 × 2 model). Since pure evaluative concerns perfectionists are likely the most susceptible to external pressures to reach high standards in sport (Gaudreau & Thompposon, 2010), this subtype is likely more susceptible to external pressures and concerns to return to sport after injury as early as possible as compared to mixed perfectionists (supporting Hypothesis 3 of the 2 × 2 model). Lastly, given that mixed perfectionists likely attribute injury-related setbacks to their self-worth, experience concerns with letting down coaches and teammates, and experience anxieties over falling behind in sport, this subtype is likely at a greater risk for sport injury rehabilitation overadherence as compared to pure personal standards perfectionism (supporting Hypothesis 4 of the 2 × 2 model).

Perfectionism and overstriving. A second body of literature that could be helpful in predicting the relationship between perfectionism and overadherence is research linking perfectionism with overstriving, or excessively pursuing high standards, in contexts outside of injury rehabilitation. One context in which perfectionists may overstrive is in exercise (Hagan & Hausenblas, 2003). Exercise dependence consists of cravings for leisure-time physical activity that results in uncontrollable and excessive exercise behaviours (Hausenblas & Symons Down, 2002). This construct parallels sport injury rehabilitation overadherence in several ways. For example, exercise dependence consists of an obsessive motivation to exercise, feeling the need to do more to achieve desired benefits, and pushing oneself to exercise despite physical and psychological problems that occur (Hausenblas & Symons Downs, 2002). Such behaviours and beliefs align well with risk factors of sport injury rehabilitation overadherence, including being overly motivated towards rehabilitation, thinking that "more is better" in rehabilitation and

pushing through symptoms of pain while rehabilitating injury. As a result, research examining perfectionism and exercise dependence could provide evidence as to how perfectionism is related to overadherence. Two studies (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017) have examined relationships between perfectionism and overtraining among athletes. Each of these studies sampled junior athletes to examine the relationship between perfectionism and training distress, a state of negative mood and stress induced by training and an early indicator of overtraining syndrome (Raglin & Morgan, 1994). Results of both studies indicated that personal standards and evaluative concerns perfectionism predicted training distress, but in contrasting directions; personal standards perfectionism was negatively related to training distress and evaluative concerns perfectionism was positively related to training distress.

Another context in which perfectionism has been associated with excessive efforts is in training. Overtraining entails overdoing training efforts and not allowing for adequate training recovery (Meeusen et al., 2013). Characteristics of this construct parallel those of sport injury rehabilitation overadherence. For example, overtraining involves athletes engaging in excessive efforts towards their goals and failing to restrict destructive behaviours. Such behaviours align well with risk factors of sport injury rehabilitation overadherence, including engaging in efforts that exceed practitioner recommendations and failing to comply to prescribed restrictions during injury rehabilitation. As a result, research examining perfectionism and overtraining could provide evidence as to how perfectionism is related to sport injury rehabilitation overadherence. Two studies have examined the relationship between multidimensional perfectionism and exercise dependence. This relationship was explored among 248 gym members by Hill, Robson, and Stamp (2015) and among 169 regular exercisers in a study by Costa, Coppolino, and Oliva (2016). Hill et al. found that aspects of both personal standards perfectionism and evaluative

concerns perfectionism positively predicted symptoms of exercise dependence. Costa et al. did not investigate the role of personal standards perfectionism, but they found that factors of evaluative concerns perfectionism were positively associated with greater levels of exercise dependence.

Taken together, the results of studies examining the role of perfectionism in exercise dependence and overtraining suggest that in the context of sport injury rehabilitation, the subtypes of perfectionism may be differentially associated with rehabilitation overadherence. The role of personal standards perfectionism in predicting overstriving for sport achievement was somewhat ambiguous. In one instance, personal standards perfectionism was positively associated with exercise dependence (Hill, Robson, & Stamp, 2015). This finding suggests that subtypes with high levels of personal standards perfectionism (e.g., pure personal standards and mixed perfectionism) are at a greater risk for excessive striving during sport injury rehabilitation as compared to subtypes with low levels of personal standards (e.g., pure evaluative concerns and non-perfectionism), indicating support for Hypothesis 1b of the 2×2 model. On the other hand, personal standards perfectionism was sometimes negatively associated with overtraining (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017). This finding suggests that subtypes with high levels of personal standards perfectionism are at a reduced risk for excessive efforts towards sport injury rehabilitation as compared to subtypes with low levels of personal standards, indicating support for Hypotheses 1a and 3 of the 2×2 model.

The role of evaluative concerns was more consistent in predicting excessive striving for sport achievement. Evaluative concerns perfectionism was positively associated with unhealthy and excessive striving towards achievement in the form of exercise dependence (Costa et al., 2016; Hill, Robson, & Stamp, 2015) and overtraining (Madigan et al., in press; Madigan,

Stoeber, & Passfield, 2017). As a result, subtypes with high levels of evaluative concerns (i.e., pure evaluative concerns and mixed perfectionism) are likely at a greater risk for exerting excessive efforts towards sport injury rehabilitation as compared to subtypes with low levels of evaluative concerns (e.g., pure personal standards and non-perfectionism). This supports Hypotheses 2 and 4 of the 2 × 2 model.

Summary of Findings: Trends, Application of Findings, and Limitations

Research examining the core characteristics of perfectionism and its demonstrated relationships with excessive striving for achievement provide evidence to how perfectionism might be related to rehabilitation overadherence. These studies demonstrate how the dimensions and subtypes of perfectionism are characteristically distinguished. Furthermore, the subtypes are differentially associated with overstriving, failing to restrict destructive behaviours, and pushing through symptoms of discomfort or pain. Personal standards plays an ambiguous role in these behaviours, where subtypes with high levels of personal standards sometimes lead to positive outcomes, but sometimes lead to negative outcomes. Notably, the healthy, flexible efforts that pure personal standards perfectionists characteristically exhibit towards achievement striving may be beneficial and lead to better outcomes as compared to non-perfectionism (supporting Hypothesis 1a) and mixed perfectionism (supporting Hypothesis 4), as evidenced by the negative relationship between personal standards and overtraining (Gotwals & Spencer-Cavaliere, 2014; Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017; Mallinson-Howard et al., 2018). On the other hand, pure personal standards perfectionists demonstrate a higher quantity of effort as compared to non-perfectionists (supporting Hypothesis 1b), which may put them at a greater risk for overadherence (Mallinson-Howard et al., 2018; Spencer-Cavaliere, 2014). This is

evidenced by the positive association between personal standards and exercise dependence (Hill, Robson, & Stamp, 2015).

Evaluative concerns, on the other hand, demonstrated a consistently negative role related to excessive striving for achievement in sport. The rigid and unrealistic efforts that pure evaluative concerns perfectionists characteristically employ, in combination with a self-worth that is dependent on sports performance and a vulnerability to external pressures to achieve high standards, may put pure evaluative concerns perfectionists at a greater risk for sport injury rehabilitation overadherence as compared to non-perfectionists (supporting Hypothesis 2) and mixed perfectionists (supporting Hypothesis 4; Gotwals & Spencer-Cavaliere, 2014; Mallinson-Howard et al., 2018). This is evidenced by the positive associations between evaluative concerns and exercise dependence (Hill, Robson, & Stamp, 2015) as well as overtraining (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017).

Nevertheless, it should be noted that there are some limitations to using these findings to make inferences about how perfectionism relates to sport injury rehabilitation overadherence. First, descriptions of the core characteristics of perfectionism described how perfectionists characteristically behave in a sport context, rather than in a sport injury rehabilitation context. Perfectionism is context-specific, and perfectionists may, therefore, behave differently during rehabilitation than they would during regular sport competition (Sellars et al., 2016). Second, none of the quantitative studies considered the simultaneous interactions of the dimensions of perfectionism. This is important, considering that both dimensions exist to varying degrees in all individuals, and may lead to different outcomes when considered simultaneously as opposed to independently (Gotwals, 2016). Third, while exercise dependence and overtraining reflect aspects of rehabilitation overadherence, they do not actually represent rehabilitation

overadherence. Since no studies have specifically explored the role of perfectionism in a sport injury rehabilitation context, and perfectionism is best represented by examining both dimensions simultaneously (Gotwals, 2016), it would be valuable to investigate the relationship between perfectionism and sport injury rehabilitation overadherence using a model, such as the 2 × 2 model, that examines the simultaneous interaction of personal standards and evaluative concerns perfectionism.

Assessment of Rehabilitation Overadherence

Conducting a study of this nature requires the ability to validly assess perfectionism and sport injury rehabilitation overadherence. Understanding of perfectionism is relatively advanced (Stoeber & Madigan, 2016), but assessment of rehabilitation overadherence is in its infancy. There is only one self-report instrument designed to assess rehabilitation overadherence: The Rehabilitation Overadherence Questionnaire (ROAQ; Podlog et al., 2013). Rather than assessing the actual degree of rehabilitation overadherence, this questionnaire assesses injured athletes' underlying beliefs related to engaging in rehabilitation efforts that exceed practitioner-recommended guidelines. The ROAQ is a 10-item questionnaire that comprises two subscales. The first subscale, Ignore Practitioner Recommendations, contains six items and assesses respondent's willingness to disregard their practitioner's suggested guidelines and restrictions for rehabilitation behaviours. The second subscale, Attempt an Expedited Rehabilitation, contains four items and assesses the respondent's willingness to accelerate the rehabilitation process to return to sport. Items from the ROAQ are presented in Table 1.

Table 1

ROAQ Subscales and Items

Rehabilitation Overadherence Questionnaire
Ignore Practitioner Recommendations "To what extent do you…" 1. Ignore your athletic trainer's advice to avoid pushing through unwanted pain? 2. Ignore your athletic trainer's recommendations to avoid specific exercises or activities? 3. Avoid reporting pain to your athletic trainer? 4. Hide pain about your injury from your doctor or other rehabilitation experts? 5. Ignore your athletic trainer's recommendations to avoid doing "too much too soon in your rehabilitation? 6. Think that your family or teammates are concerned that you ignore your athletic trainer's advice to limit the rehabilitation exercises you perform? ***Attempt an Expedited Rehabilitation*** "To what extent do you…" 7. Try to catch up with other athletes who are farther ahead in their rehabilitation? 8. Think it is usually better to do too much rehabilitation than not enough? 9. Perform more rehabilitation exercises than your athletic trainer recommends? 10. Believe you must progress as quickly as possible to avoid losing physical fitness?

Only two studies have examined the reliability and validity of assessments produced by the ROAQ. Podlog et al. (2013) originally developed the instrument in a two-part study that sampled 118 currently injured adolescent athletes and 105 currently injured collegiate athletes. Reliability and validity evidence for the ROAQ was produced through factor analysis, tests of internal consistencies, and testing theoretically expected relationships between self-presentational concerns, athletic identity, and rehabilitation overadherence (Podlog et al., 2013). Hilliard et al. (2016) further tested validity and reliability evidence of the ROAQ using a sample of 80 injured collegiate athletes. Small changes were made to the measure, as per the recommendations by Podlog et al. A new statement stem was utilized in order to examine both subscales using the same stem, which resulted in slight re-wording of some statements. Hilliard et al. further tested the validity and reliability evidence of the ROAQ through factor analysis,

tests of internal consistencies, and testing theoretically expected relationships between athletic identity and rehabilitation overadherence.

The development of the ROAQ kickstarted empirical examination of overadherence and, therefore, represented an important and timely contribution to the literature. There are reasons, though, to be concerned about the reliability and validity of assessments produced by the instrument. The Attempt an Expedited Rehabilitation subscale in particular has demonstrated questionable evidence of reliability and validity. For instance, estimates of the subscale's internal consistency were $\alpha = .70$ and $\alpha = .66$ (Podlog et al., 2013 and Hilliard et al., 2016, respectively). These values are relatively low in comparison to generally accepted guidelines (i.e., $\alpha = .70$; Nunnally, 1978). This subscale has also demonstrated poor factor structure. Two items ("To what extent do you try to try to catch up with other athletes who are farther ahead in their rehabilitation?" and "To what extent do you believe you must progress as quickly as possible to avoid losing physical fitness?") showed meaningful loadings (i.e., greater than .30) in Hilliard et al.'s factor analysis on their intended factor and the factor representing the Ignore Practitioner Recommendations subscale. The content relevance and focus of items in the Attempt and Expedited Rehabilitation subscale is also questionable. Some items appear to be more relevant to the Ignore Practitioner Recommendations subscale (e.g., "To what extent do you perform more rehabilitation exercises than your athletic trainer recommends?") or require respondents to be going through rehabilitation with peers (e.g., "To what extent do you try to catch up with other athletes who are further ahead in their rehabilitation?"). Finally, another item (e.g., "To what extent do you believe you must progress as quickly as possible to avoid losing physical fitness?") provides a specific reason for expediting rehabilitation that might not be relevant to all injured athletes.

There are also concerns regarding the relevancy and focus of the ROAQ's Ignore Practitioner Recommendations subscale. Three of six items (e.g., "To what extent do you hide pain about your injury from your doctor or other rehabilitation experts?") emphasize hiding pain or pushing through pain rather than explicitly assessing the degree to which athletes ignoring practitioner recommendations. Although pushing through symptoms of pain is likely an important factor to consider in terms of rehabilitation overadherence (Niven, 2007; Podlog et al., 2013), items assessing this component of overadherence seem to be over-represented in this subscale. Another item (e.g., "To what extent do you think that your family or teammates are concerned that you ignore your athletic trainer's advice to limit the rehabilitation exercises you perform?") assumes that respondents already ignore their practitioner's advice and prioritizes social concerns about this behaviour rather than the behaviour itself.

Given the documented reliability and validity concerns regarding the ROAQ, and the fact that these concerns collectively relate to a majority of the items in the 10-item instrument, it is questionable whether it would be appropriate to use the instrument to establish relationships between sport injury rehabilitation overadherence and perfectionism. As a result, this study developed and utilized a new measure of rehabilitation overadherence among injured athletes. This instrument is labeled the Sport Injury Rehabilitation Overadherence Scale (SIROS) and is described in detail in the Method section.

Purpose and Hypotheses

The purpose of the current study was to examine the relationship between perfectionism and sport injury rehabilitation overadherence, using the 2 × 2 model of perfectionism as a conceptual framework. Hypotheses were developed through consideration of the stock hypotheses provided by the 2 × 2 model in combination with evidence from past research

defining the core characteristics of perfectionism and research exploring relationships between perfectionism and forms of overstriving (e.g., Gotwals & Spencer-Cavaliere, 2014; Hill, Robson, & Stamp, 2015; Madigan et al., in press). Hypotheses were also created under the notion that overadherence is a negatively-laden construct that could lead to adverse outcomes (Granquist et al., 2014; Niven, 2007).

To summarize the reviewed literature, core characteristics of perfectionism and trends linking perfectionism with forms of overstriving provide evidence to support Hypotheses 1a, 1b, 2, 3, and 4 of the 2 × 2 model. In line with past controversy on the role of personal standards perfectionism (Hill, 2016), personal standards was associated with greater levels of exercise dependence (Hill, Robson, & Stamp, 2015) but lower levels of overtraining (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017). In the context of sport injury rehabilitation, the healthy and flexible achievement striving demonstrated by subtypes with high levels of personal standards (i.e., pure personal standards and mixed perfectionism) could play a protective role in reducing rehabilitation overadherence (Hypotheses 1a and 2), or, conversely, their excessive efforts could serve as a risk factor for such behaviours (Hypothesis 1b; Gotwals & Spencer-Cavaliere, 2014). On the other hand, evaluative concerns was consistently associated with greater levels of exercise dependence (Costa et al., 2016; Hill, Robson, & Stamp, 2015) and overtraining (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017). In the context of sport injury rehabilitation, this indicates that pure evaluative concerns and mixed perfectionists might strive obsessively for unrealistic standards during rehabilitation and be more willing to risk a premature return to sport as compared to non-perfectionists (supporting Hypothesis 2) and pure personal standards perfectionists (supporting Hypothesis 4; Gotwals & Spencer-Cavaliere, 2014; Mallinson-Howard et al., 2018). Pure evaluative concerns perfectionists might be even

more inclined to do so as compared to mixed perfectionists, considering they are likely more susceptible to external pressures to return to sport (supporting Hypothesis 3; Gaudreau & Thompson, 2010.

The following hypotheses were developed in light of the aforementioned findings. In line with Hypothesis 1b, it was expected that, given the stressful environment of sport injury rehabilitation and pressures to return to sport (Podlog & Eklund, 2006), pure personal standards perfectionists would be at a greater risk for rehabilitation overadherence as compared to non-perfectionists (Gaudreau et al., 2017). In line with Hypothesis 2, it was expected that pure evaluative concerns perfectionists would be at a greater risk for rehabilitation overadherence as compared to non-perfectionists. In line with Hypothesis 3, it was expected that pure evaluative concerns perfectionists would be at a greater risk for rehabilitation overadherence as compared to mixed perfectionists. In line with Hypothesis 4, it was expected that mixed perfectionists would be at a greater risk for rehabilitation overadherence as compared to pure personal standards perfectionists.

Method

Research Design

In line with recommendations for sport injury rehabilitation research (Brewer, 1998; Petrie & Falkstein, 1998), this injured athletes' rehabilitation behaviours and beliefs were assessed as they were currently undergoing sport injury rehabilitation. A cross-sectional research design was implemented to capture injured athletes' behaviours and beliefs towards rehabilitation overadherence at the time that they were going through treatment. This method

eliminated limitations of respective designs that could lead to biased and inaccurate responses (Brewer, Van Raalte, Linder, & Van Raalte, 1991).

Targeted Participants

To participate in this study, participants met four criteria. First, participants were required to be at least 16 years of age and able to provide informed consent. Second, participants were required to have trained for and/or competed in at least one sport an average of two times per week, prior to the injury in order to be considered an "athlete". Sport was defined as any "activity involving physical exertion and skill in which an individual or team competes against another or others" (Oxford Dictionary, 2017). Third, participants were currently injured and had a restricted ability to participate in their sport as a result of their injury. This included being completely unable to participate in training or competition, partaking in some training and practices but being unable to participate in competition, or being limited in participation during training and competition. Fourth, participants were required to be actively working with a rehabilitation practitioner (e.g., physiotherapist, kinesiologist, athletic therapist) to rehabilitate their injury. To meet this requirement, athletes had a previous rehabilitation appointment and another subsequent appointment scheduled. Additionally, the practitioner must have prescribed exercises for the participant to complete on their own to facilitate the rehabilitation of the injury.

Participants were excluded from the study if they had a health condition that made participation in sport ill-advised, that was beyond the scope of practice of a rehabilitation practitioner, and/or that might have been negatively exacerbated through participation in the study. For example, individuals were excluded if they had a chronic illness, were hospitalized, had an acute concussion or persistent concussion symptoms, or were medically unstable.

Measures

The study utilized a questionnaire package containing four self-report instruments. The purpose of this thesis aligned with three of these instruments. Responses from a third instrument were collected for use in future projects but were not used for the purposes of this study. The three instruments completed for the purposes of this study assessed demographical information, risk factors of rehabilitation overadherence, and multidimensional sport perfectionism. The demographic questionnaire was always presented first, while the order of the other questionnaires was counterbalanced to control for order effects.

Demographics. Participants were asked to complete a demographics questionnaire that elicited information regarding respondents' personal characteristics, involvement in sport, current injury, and current rehabilitation experience. This questionnaire is presented in Appendix A. Regarding personal characteristics, respondents were asked to indicate their gender and age. Regarding sport involvement, respondents were asked to indicate what sport they were training/competing for at the time of their injury, the length of time they played that sport, their current level of competition (local, regional, national, or international), and how many days a week they spent training or competing in their sport. Space was provided for respondents to provide answers for up to four different sports. Regarding the current injury, respondents were asked to indicate the injury they were currently receiving treatment for, the onset of the current injury (i.e., suddenly or gradually), the degree to which their sport restriction was limited as a result of the current injury (1 = *able to participate with slight restrictions*, 3 = *able to participate with moderate restrictions*, 5 = *completely restricted from participation*), the date that the injury occurred, and whether or not surgery was, or would be, required. Lastly, regarding the current rehabilitation experience, respondents were asked to indicate the profession of the practitioner

that played the biggest role in their rehabilitation experience, the date that they first met with that practitioner for their current injury, the number of treatment appointments attended with that practitioner for the current injury, what types of home exercises had been assigned as a part of their rehabilitation, and where they felt they were in the rehabilitation process (1 = *just beginning*, 3 = *halfway through*, 5 = *nearing the end*).

Rehabilitation overadherence. A newly designed instrument, the Sport Injury Rehabilitation Overadherence Scale (SIROS) was used to assess sport injury rehabilitation overadherence. Similar to the past measures of rehabilitation overadherence (i.e., ROAQ; Podlog et al., 2013), the SIROS did not assess the actual degree of sport injury rehabilitation overadherence. Instead, it assessed risk factors towards the behaviour. The SIROS is comprised of four subscales: Inclinations to Overadhere, Expedited Rehabilitation, Effortful Healing, and Normalization of Pain. Each subscale was designed to assess a unique rehabilitation overadherence risk factor. The risk factors targeted in Inclination to Overadhere and Expedited Rehabilitation were recognized in the only other measure of rehabilitation overadherence (i.e., the ROAQ), while the risk factors targeted in Effortful Healing and Normalization of Pain are unique to the SIROS. The subscales for Effortful Healing and Normalization of Pain were developed by adapting existing scales in the literature, while Inclinations to Overadhere and Expedited Rehabilitation were newly developed. Regardless of the method used to develop the subscales, each was based on existing descriptions of overadherence risk factors available in the current literature (Granquist et al., 2014; Hilliard et al., 2016; Niven, 2007; Podlog et al., 2013). The following sub-sections describe the subscales and their development in greater detail.

Inclinations to Overadhere. Injured athletes who overadhere to sport injury rehabilitation have been described as having inclinations to overdo the rehabilitation guidelines set by their

rehabilitation practitioners (Granquist et al., 2014; Hilliard et al., 2016; Podlog et al., 2013). The ROAQ attempted to assess this risk factor in the Ignore Practitioner Recommendations subscale. As documented earlier, though, this subscale had issues with the relevancy and focus of some items. There was an over-representation of items related to hiding or pushing through pain as well as a focus on social concerns over ignoring practitioner recommendations, rather than the behaviour itself. The Inclinations to Overadhere subscale of the SIROS was designed with these concerns in mind. The subscale is comprised of eight original items designed to assess injured athletes' Inclinations to Overadhere to rehabilitation practitioner's recommendations. Examples of such inclinations included exceeding the frequency, intensity, and amount of prescribed home exercises, and re-engaging in sport earlier, and/or at a higher intensity, than recommended. Domain specifications and items for the subscale are presented in Table 2.

Table 2

Inclinations to Overadhere Subscale: Domain Specifications and Items

Title
Inclinations to Overadhere
Domain Specifications
Injured athletes' Inclinations to Overadhere to rehabilitation practitioner's recommendations by exceeding the frequency, intensity, and amount of prescribed home exercises and re-engaging in sport earlier, and/or at a higher intensity, than recommended.
Items

1. I have a desire to do my rehabilitation activities more often than my practitioner prescribed.
  2. I tend to intensify the rehabilitation exercises recommended by my practitioner.
  3. I'm apt to exceed my practitioner's guidelines regarding the rehabilitation of my injury.
  4. I'm apt to return to my sport, or to play my sport at full speed, earlier than recommended by my practitioner.
  5. When I return to sport, I'm apt to play or train at a higher intensity than recommended by my practitioner.
  6. I'm inclined to overdo the rehabilitation activities prescribed by my practitioner.
  7. When I return to my sport, I have (or will have) trouble adhering to my practitioner's recommendations to hold back my effort.
  8. Despite my practitioner's suggestions, I'm inclined to do "too much, too soon" when returning to sport.

Expedited Rehabilitation. Injured athletes who are very motivated and enthusiastic to get back to sport may attempt to expedite the rehabilitation process in order to return to sport as quickly as possible, putting them at risk for sport injury rehabilitation overadherence (Granquist et al., 2014; Hilliard et al., 2016). The ROAQ attempted to assess this risk factor in the Attempt an Expedited Rehabilitation subscale. As documented earlier, this subscale demonstrated low values of internal consistency, poor factor structure, and questionable content relevance. The Expedited Rehabilitation subscale of the SIROS was designed with these concerns in mind and is comprised of five items that were designed to assess the respondent's desire to expedite the rehabilitation of his/her injury in an effort to rush a return to sport. Domain specifications and items for this subscale are presented in Table 3.

Table 3

Expedited Rehabilitation Subscale: Domain Specifications and Items

Title
Expedited Rehabilitation
Domain Specifications
Injured athletes' desires to expedite the rehabilitation of his or her injury in an effort to rush a return to sport.
Items
1. The faster I can rehabilitate my injury, the faster I can get back to my sport—that's important to me.   2. I want to rehabilitate my injury quickly so that I can speed up my return to sport.   3. I am eager to rehabilitate my injury quickly because that means that I can get back to my sport sooner.   4. I want to get through my injury rehabilitation as fast as I can so that I can return to my sport as soon as possible.   5. Speeding up the rehabilitation of my injury is important because it cuts down on the time that I am away from my sport.

Effortful Healing. Injured athletes may internalize the dominant ethic of sport and think that more effort is better in terms of injury rehabilitation, putting them at a greater risk to overadhere (Arvinen-Barrow et al., 2016; Granquist et al., 2014). This risk factor was not

assessed by the ROAQ. The SIROS attempts to assess this risk factor through a subscale entitled, Effortful Healing. This subscale was developed by modifying the Improvement subscale from the Conceptions of the Nature of Athletic Ability Questionnaire-2 (Biddle, Wange, Chatzisarantis, & Spray, 2003) to fit the sport injury rehabilitation context. The Improvement subscale is comprised of three items designed to measure the degree to which individuals perceive athletic ability to improve with hard work and effort. This original subscale is supported by evidence of reliability and validity (Biddle et al., 2003). In the Effortful Healing subscale of the SIROS, the three items from the Improvement subscale were revised to capture injured athletes' beliefs that the rehabilitation of their injury will improve with hard work and effort. Two primary revisions were applied. First, items were adapted to refer to working hard in treatment, rather than working hard at sport. Second, items were adapted to refer to successfully healing an injury, rather than improving sport performance. Table 4 presents the original and revised items.

Table 4

Effortful Healing Subscale: Domain Specifications, Original Items, and Modified Items

Original Subscale	Subscale Adapted for the SIROS
Title Improvement subscale (Conceptions of the Nature of Athletic Ability Questionnaire-2; Biddle et al., 2003)	**Title** Effortful Healing
Domain Specifications Athletes' beliefs that athletic ability improves with hard work and effort.	**Domain Specifications** Injured athletes' beliefs that the rehabilitation of their current injury will improve with hard work and effort.
Items 1. If you put enough effort into it, you will always get better at sport. 2. How good you are at sport will always improve if you work at it 3. In sport, if you work hard at it, you will always get better.	**Items** 1. If I put enough effort into rehabilitation, my injury will always get better. 2. My injury will always improve if I work at my rehabilitation. 3. In rehabilitation, the harder I work hard at it, the faster my injury will heal.

Normalization of Pain. Injured athletes may normalize symptoms of pain and discomfort as a regular part of the rehabilitation process, putting them at a greater risk to overadhere (Podlog et al., 2013). This risk factor was not assessed by the ROAQ. The SIROS attempts to assess this risk factor through a subscale entitled Normalization of Pain. This subscale was developed by modifying the Coping subscale from the Sports Inventory for Pain (Meyers, Bourgeois, Stewart, & LeUnes, 1992). The Coping subscale is comprised of eight items and was originally designed to measure the tendency for athletes to cope with pain in sport by accepting it as a normal component of sport and to view it as a challenge that they should attempt to push through. This original subscale is supported by evidence of reliability and validity (Meyers et al., 1992). In the Normalization of Pain subscale of the SIROS, seven items from the Coping subscale were used to capture injured athletes' tendencies to normalize the experience of pain during the rehabilitation of their injury by accepting it, viewing it as a challenge, and pushing through it. One item from the original scale, "I am more interested in returning to athletic competition than trying to stop the pain" was not used because it seemed to focus more on prioritizing a return to sport rather than pushing through and normalizing pain. One primary adaptation was made to the Normalization of Pain subscale: all items were made specific to injury rehabilitation rather than sport. Table 5 presents the original and revised items.

Table 5

Normalization of Pain Subscale: Domain Specifications, Original Items, and Modified Items

Original Subscale	Subscale Adapted for the SIROS
Title Coping (Sports Inventory for Pain; Meyers et al., 1992)	**Title** Normalization of Pain
Domain Specifications Athletes' tendencies to cope with pain by accepting it as a normal component of sport.	**Domain Specifications** Injured athletes' tendencies to normalize the experience of pain during injury rehabilitation by accepting it, viewing it as a challenge, and/or pushing through it.
Items 1. When the pain is bad, I owe it to myself and others to compete. 2. When injured, I tell myself to be tough and carry on. 3. When I am hurt, I just go on as if nothing happened. 4. When injured, no matter how bad pain gets, I can handle it. 5. When I am hurt, I see pain as a challenge, and it doesn't bother me 6. Pain is just a part of competition. 7. When injured, I can't let the pain stand in the way.	**Items** 1. When I experience pain in rehabilitation, I believe I owe it to myself and others to push through it. 2. When my injury rehabilitation becomes painful, I tell myself to be tough and carry on. 3. When rehabilitating my injury gets painful, I just go on as if nothing happened. 4. No matter how bad the pain gets as I rehabilitate my injury, I can handle it. 5. I see the pain associated with the rehabilitation of my injury as a challenge, and it doesn't bother me. 6. Pain is just a part of rehabilitation. 7. When rehabilitating my injury hurts, I do not let the pain stand in the way.

The SIROS is presented in its entirety in Appendix B. The instrument is comprised of 23 items and asks respondents to answer items according to their rehabilitation experiences with their current injury. Responses to all items are based on a 5-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). Subscale scores were calculated by averaging responses to items associated within each subscale, with higher scores reflecting greater propensities towards rehabilitation overadherence. Given that the SIROS is comprised of two newly developed

subscales and two developed through the modification of subscales from other instruments, the questionnaire must be considered an exploratory instrument.

Perfectionism. The Sport Multidimensional Perfectionism Scale-2 (Sport MPS-2; Gotwals & Dunn, 2009) was used to measure the higher-order dimensions of personal strivings perfectionism and evaluative concerns perfectionism. The Sport MPS-2 contains six subscales including Personal Standards, Concern Over Mistakes, Doubts About Actions, Organization, Perceived Parental Pressure, and Perceived Coach Pressure. Only the Personal Standards, Concern Over Mistakes, and Doubts About Actions were utilized in this study. These three subscales represent core facets of personal standards perfectionism or evaluative concerns perfectionism (Stoeber & Madigan, 2016). The Perceived Parental Pressure and Perceived Coach Pressure subscales were not utilized, because these scales assess facets of perfectionism that may not be relevant to the targeted participants (participants were 16 years of age or older). The Perceived Parental Pressure subscale might not have been as relevant to adult participants as it may be for adolescents. Targeted participants also played a range of different sports at varying levels of competition and as such The Perceived Coach Pressure items would not be relevant to participants who play recreational sports and may not have a coach. The Organization subscale was not utilized as per suggestions of Stoeber and Madigan (2016), who stipulated that Organization assesses a more peripheral aspect of perfectionism, rather than a defining characteristic of the personality trait. As a result, it is not considered to be a good indicator of perfectionism (Stoeber & Madigan, 2016).

The Personal Standards subscale was used to represent personal standards perfectionism. The Personal Standards subscale contains seven items and reflects respondents' tendencies to set and strive for very high standards of performance (e.g., "I have extremely high goals for myself

in sport"). The Concern Over Mistakes and Doubts About Actions subscales were used to represent evaluative concerns perfectionism. The Concern Over Mistakes subscale contains eight items and captures respondents' tendencies to worry about making mistakes in competition and the ramifications of those mistakes (e.g., "If I fail in competition, I feel like a failure as a person"). The Doubts About Actions subscale contains six items and captures the degree to which respondents feel uncertain about their preparedness for competition (e.g., "I rarely feel that my training fully prepares me for competition"). Past research supports the use of the Personal Standards subscale to represent personal standards perfectionism and the combined use of the Concern Over Mistakes and Doubts About Actions subscales to represent evaluative concerns perfectionism (Stoeber, 2011; Stoeber & Madigan, 2016).

The Sport-MPS-2 is presented in Appendix C. The version of the Sport-MPS-2 used in this study was comprised of 37 items and utilized a 5-point Likert response scale (1 = *strongly disagree*; 5 = *strongly agree*). Higher subscale scores reflected a greater level of the facet of perfectionism assessed. Scores for each subscale were produced by first standardizing (i.e., $M = 0$; $SD = 1$) and then summing the mean subscale scores. Standardization of the subscale allowed each component of perfectionism to be weighted equally (Stoeber & Madigan, 2016). The Sport-MPS-2 was originally designed to be applicable only to athletes in team sports (e.g., hockey, soccer, basketball). In this study, the measure was adapted to make it also applicable to athletes in individual sports (e.g., running, wrestling, swimming). For example, the item "If a team-mate or opponent (who plays a similar position to me) plays better than me during competition, then I feel like I failed to some degree" was adapted to "If a team-mate or opponent plays better than me during competition, then I feel like I failed to some degree". The Sport MPS-2 has demonstrated ample reliability and validity evidence in the form of factorial validity, convergent

validity, and acceptable internal consistency among samples of athletes (Dunn et al., 2006;

Gotwals & Dunn, 2009; Gotwals, Dunn, Causgrove Dunn, & Gamache, 2010).

Procedure

      Participant recruitment. After receiving ethical approval from the Lakehead University

Research Ethics Board, three primary recruitment strategies were used to recruit prospective

participants. All reflected nonprobability sampling techniques, including purposive and snowball

sampling, given that injured athletes could be a difficult population to recruit (Clement &

Shannon, 2011). One recruitment strategy was to work in collaboration with various individuals

who could serve as gatekeepers to potential participants. A gatekeeper was defined as any

individual who had regular access to athletes actively engaged in training or competition and/or

athletes undergoing rehabilitation for a sport-related injury. Examples included rehabilitation

practitioners (e.g., physiotherapists, athletic therapists, massage therapists, and chiropractors)

and sport-related authorities (e.g. athletic directors, coaches, and team captains). The researcher

contacted the gatekeepers, informed them of the present study (see gatekeeper information letter

in Appendix D), and asked if they would like to work in collaboration to recruit participants for

the study. Those interested in collaboration were asked to identify athletes who met the inclusion

criteria, provide those athletes with a brief description of the present study, and if the athletes

were interested, arrange for the researcher to meet or get in contact with the potential

participants. While the gatekeepers were used to introduce the researcher to participants, they

were not present during the study recruitment session and did not have access to any participant

responses.

      A second recruitment strategy was to recruit potential participants directly. For example,

after gaining the appropriate approvals, posters advertising the study were displayed at relevant

facilities across the city (e.g., sports medicine clinics, athletic offices, sports facilities). The posters described the purpose, inclusion criteria, and basic procedures for the study and requested that interested potential participants contact the primary researcher for more information. A third recruitment strategy involved snowball sampling, whereby participants were asked to identify other individuals who met the inclusion criteria and facilitated recruitment by arranging for the researcher to meet or contact those potential participants in order to inform them of the study.

Once identified, the researcher arranged to meet individually with each potential participant for a recruitment session. Whenever possible, sessions took place in person at a regularly scheduled therapy/rehabilitation appointment, team practice, or training session. When an in-person session was impractical, recruitment sessions took place over the phone or e-mail. During recruitment sessions, the researcher informed participants about the study (see participant information letter in Appendix E). Potential participants were told that the purpose of the study was to examine how personality factors played a role in athletes' injury rehabilitation experiences. This description was phrased this way, in an attempt to avoid participants' preconceived notions of perfectionism or rehabilitation overadherence from influencing their questionnaire responses. Potential participants were told that the quality of their rehabilitation and experience in sport would not be affected by their decision to participate in the study or by the nature of the responses on the questionnaire. Potential participants were told that individuals associated with their injury rehabilitation (e.g., physiotherapists, athletic therapists), engagement in sport (e.g., team coach, teammates), or personal life (e.g., parent, significant other) would not be informed about their participation nor have access to their responses. This hopefully prevented participants from feeling pressure to present themselves in a more desirable manner

when responding to questions. Once participants were informed, they were asked if they would like to participate in the study. Participants were then asked to sign an informed consent form (see Appendix F) and to schedule a data collection session with the student researcher.

Data collection. Data collection sessions took place after participants attended at least one injury rehabilitation appointment and were assigned home exercises (e.g., stretching, strengthening, balance, cardio, applying heat/ice) by their rehabilitation practitioner. At data collection sessions, participants were asked to complete the questionnaire package. This process took approximately 15-20 minutes and these sessions took place at a time that was amenable to participants' schedules. Data collection sessions took place in several different settings. The majority of data collection sessions took place during the participant's regularly scheduled appointments for treatment. In this case, participants completed the questionnaires either before or after their regularly scheduled appointments. When it was feasible and allowed by the practitioner, some of these participants completed the questionnaire package while undergoing treatment (i.e., while icing or heating an injury). If participants were still involved with their team, data collection also took place at regularly scheduled team meetings, practices, or training sessions. Participants were also given the option of meeting the primary researcher at her office at the Lakehead University in the Sanders Building. In some cases, participants were not able to complete the questionnaires in person. In such cases, participants either took the questionnaire package home to complete or completed an electronic version. After the participant finished responding to the questionnaires, the questionnaires were returned to the researcher, either via e-mail, in person, or returned in sealed envelopes, with the help of the gatekeepers. After the questionnaire package was returned, the researcher thanked the participant for his/her participation in the study.

Data Analysis

All data analyses were conducted through version 25 of the Statistical Package for the Social Sciences© (SPSS). Preliminary analyses included screening for and correcting errors in data entry, screening for and replacing missing data, identifying and evaluating potential outliers, and evaluating the psychometric properties and internal consistencies of each subscale.

Multiple regression analyses were conducted to examine the interactive effects of personal standards and evaluative concerns perfectionism on each overadherence risk factor. A preliminary evaluation of multicollinearity was run before conducting these analyses by examining bivariate correlations between the dimensions of perfectionism and overadherence and by checking variance inflation factor (VIF) values. Four separate multiple regressions were performed through the PROCESS (Hayes, 2013) macro for SPSS. In each regression, a risk factor of overadherence was entered as a dependent variable, evaluative concerns perfectionism was entered as the predictor variable, and personal standards perfectionism was entered as the moderator variable. Because factors related to age, commitment to sport, length of the injury rehabilitation process, and rehabilitation practitioner–client relationship were thought to play a role in sport injury rehabilitation adherence (Granquist et al., 2014; Niven, 2007), several variables from the demographic questionnaire were included as covariates in each regression. These included personal, sport-related, injury-related, and rehabilitation-related characteristics. Personal characteristics included age and gender. Sport-related characteristics included years spent playing the sport(s), level of sport competition, time spent playing sport(s) per week, and perceived restriction from the sport(s) as a result of the current injury. Injury-related characteristics included the length of time since the occurrence of the current injury and the onset of the current injury (i.e., sudden or gradual). Lastly, rehabilitation-related characteristics

included the length of time spent rehabilitating the current injury, and the number of

appointments for treatment attended for the current injury. Characteristics were controlled for in

the regression analyses process in order to reduce the variance accounted for by the potential

covariates to help ensure that any relationship observed was solely based on the relationship

between perfectionism and rehabilitation overadherence. Standard errors for all parameters were

adjusted for violations of homoscedasticity (via the HC3 standard error estimator; Hayes & Cai,

2007).

An interaction effect was deemed to be present if the coefficient associated with the

interaction term was statistically significant ($p < .05$). If an interaction effect was detected, the

interaction was probed both visually and empirically. Visual probing involved creating a visual

representation of the relationship to interpret general trends (Hayes, 2013). Empirical probing

involved the interpretation of a simple slopes analysis. Four simple slopes were calculated to

test the hypotheses of the 2×2 model (Gaudreau, 2012). The first simple slope tested the effects

of the personal standards at low levels of evaluative concerns (testing Hypothesis 1; non-

perfectionism vs. pure personal standards perfectionism). The second simple slope tested the

effects of personal standards at high levels of evaluative concerns (testing Hypothesis 3; mixed

perfectionism vs. pure evaluative concerns perfectionism). The third simple slope tested the

effects of evaluative concerns at low levels of personal standards (testing Hypothesis 2; non-

perfectionism vs. pure evaluative concerns perfectionism). The fourth simple slope tested the

effects of evaluative concerns at high levels of personal standards (testing Hypothesis 4; mixed

perfectionism vs. pure personal standards perfectionism). A statistically significant effect ($p <$

.05) for a simple slope indicated support for its respective hypothesis. The Johnson-Neyman

technique was used as an additional inferential test to identify the regions of significance by

identifying where, on the range of personal standards scores, evaluative concerns predicted rehabilitation overadherence, and where it did not.

In the absence of a significant interaction effect, the main effects for personal standards perfectionism and evaluative concerns perfectionism were tested by dropping the interaction term and re-running the regressions, this time using the HCREG macro (Hayes & Cai, 2007) for SPSS. Removing the interaction term ensured that the effects of personal standards and evaluative concerns were not conditional on the non-significant interaction term (Gaudreau, 2012). After the interaction term was removed, the main effects of personal standards and evaluative concerns were then used to make statistical inferences about the 2×2 hypotheses. These effects were analyzed by creating a visual interpretation of the regression and examining the general trends. On the grounds that each rehabilitation overadherence risk factor represented a negatively-laden construct that could lead to adverse outcomes, a significant positive main effect for personal standards would show that pure personal standards perfectionism leads to greater levels of rehabilitation overadherence as compared to non-perfectionism (supporting Hypothesis 1b). A significant negative main effect for personal standards would indicate that non-perfectionism was associated with greater levels of rehabilitation overadherence as compared to pure personal standards perfectionism (supporting Hypothesis 1a) and that pure evaluative concerns perfectionism was associated with greater levels of rehabilitation overadherence as compared to mixed perfectionism (supporting Hypothesis 3). A significant positive main effect for evaluative concerns would indicate that pure evaluative concerns perfectionism was associated with greater levels of rehabilitation overadherence as compared to non-perfectionism (supporting Hypothesis 2) and that mixed perfectionism was associated with greater levels of rehabilitation overadherence as compared to pure personal standards

perfectionism (supporting Hypothesis 4). Conversely, a significant negative main effect for evaluative concerns would not support any hypotheses of the 2×2 model.

Results

Participants

Participants included 82 female ($n = 40$) and male ($n = 42$) currently injured athletes. Participants were aged on average 27.5 years ($SD = 10.9$) and competed in a variety of different sports; the most common of which were hockey ($n = 19$), running ($n = 17$), basketball ($n = 17$), volleyball ($n = 14$), and ultimate frisbee ($n = 9$). Participants reported training or competing in their sport an average of 4.1 days/week ($SD = 2.04$) and competed in their sport for an average of 11.4 years ($SD = 8.25$). The highest level of competition that participants competed in their sport(s) was at a local ($n = 29$), regional ($n = 17$), national ($n = 25$), and international ($n = 11$) level.

Participants were receiving treatment for a variety of different injuries. The most common injuries included Achilles tendinopathies ($n = 5$), anterior cruciate ligament sprains ($n = 7$), and herniated discs ($n = 4$). A number of participants reported that they perceived their current injury to completely restrict their sport participation in at least one sport ($n = 30$). Some reported being able to participate with moderate restrictions ($n = 20$); while others were able to participate with only slight restrictions ($n = 8$). Participants identified physiotherapists ($n = 37$) and athletic therapists ($n = 25$) to be the primary rehabilitation practitioners that played the largest role in their treatment; however, some participants also listed chiropractors ($n = 6$), kinesiologists ($n = 2$), and other practitioners ($n = 5$) as their primary rehabilitation practitioner.

As a part of their injury rehabilitation, participants were assigned various home exercises, including stretching exercises ($n = 65$), strengthening exercises ($n = 65$), balance exercises ($n = 35$), cardiovascular training exercises ($n = 16$), and applying heat/ice to the injury ($n = 50$). Participants were at varying stages of their injury rehabilitation. Some were in the first week of the acute phase of the rehabilitation process, while others were in the chronic phase having attended treatment for up to 1026.0 weeks ($M = 50.0$ weeks, $SD = 127.2$). The number of appointments with their primary rehabilitation practitioner ranged from 1 to 750 appointments ($M = 40.0$ appointments, $SD = 97.0$).

Preliminary Analysis

Data entry errors. Preliminary analyses began with a frequency analysis to check for and address any mistakes in data entry. Two errors were found. First, a 44 was entered for an item on the perfectionism questionnaire where valid responses ranged only from 1 – 5. Second, a 5 was entered for an item indicating whether or not surgery was required for the injury where valid responses were either 1 (no surgery required) or 2 (surgery required). The mistakes were corrected, and the frequency analysis was run again to ensure that the identified mistakes had been corrected. This also allowed for the identification of other data entry errors that were overlooked in the initial frequency analysis. No additional errors were detected.

Missing data. Two participants had large amounts of missing data (i.e., one was missing an entire page of the SIROS and one was missing an entire page of the perfectionism questionnaire). These participants were removed from the dataset, leaving a total of 80 participants. Within this sample, there were 15 missing data points out of 4888, or 0.03%. Although anything less than 5% is considered a small amount of missing data (Tabachnik & Fidell, 2013), leaving these missing data points empty or simply removing cases with missing

data can reduce statistical power and compromise generalizability, thereby affecting subsequent analyses (Kang, 2013). Instead, imputation techniques were used to replace missing data. To determine which imputation technique to use, the data was first tested to see whether missing data occurred in a random manner. Little's Test was used and not significant, $x^2(698, n = 60) = 699.36, p = .48.$ and suggested that the missing data was indeed completely random. This result, in combination with the very low percentage of missing data, allowed for the use of a variety of imputation techniques. In this case, missing data points were replaced using the expectation maximization technique, where missing data points were replaced by the value deemed statistically most likely based on responses to other items on that subscale.

Descriptive statistics and internal consistencies. Subscale mean item scores were then calculated for the rehabilitation overadherence risk factors assessed by the SIROS and the Personal Standards, Concern Over Mistakes, and Doubts About Actions subscales of the Sport-MPS-2. The subscale means, along with their associated standard deviations, skewness, and kurtosis values are presented in Table 6. As indicated in Table 6, the Expedited Rehabilitation values showed a strong negative skew and a high kurtosis value. From a statistical perspective, this is not a concern because the primary analysis, multiple regression, is robust against violations of assumptions of normality (Hill & Lewicki, 2007). It does, however, provide information about the distribution of this subscale. These skewness and kurtosis values indicate that the majority of respondents scored highly on the Expedited Rehabilitation subscale. The remaining subscales presented moderately normal distributions based on their levels of skewness and kurtosis.

Table 6

Descriptive Statistics and Estimates of Internal Consistency for SIROS and Sport-MPS-2

Subscales

Variables	*M*	*SD*	Skewness	Kurtosis	Internal Consistency (α)
SIROS					
Inclinations to Overadhere	3.22	0.77	-0.42	-0.30	0.85
Expedited Rehabilitation	4.01	0.82	-1.13	1.43	0.86
Effortful Healing	3.54	0.83	-0.58	0.64	0.64
Normalization of Pain	2.94	0.87	0.02	-0.23	0.87
Sport MPS-2					
Personal Standards	3.62	0.74	-0.60	0.15	0.85
Concern Over Mistakes	2.75	0.77	0.08	-0.53	0.83
Doubts About Actions	2.55	0.74	0.28	-0.28	0.81

Note. SIROS: Sport Injury Rehabilitation Overadherence Scale; Sport-MPS-2: Sport Multidimensional Perfectionism Scale-2.

Table 6 also presents estimates of internal consistency for each subscale, in the form of Cronbach's alpha. All values were above the generally recommended level of .70, indicating an acceptable level of internal consistency (Nunnally, 1978), with the exception of the Effortful Healing subscale. The Cronbach's alpha value for this subscale was .64. Loewenthal (2001) reported that Cronbach's alpha values greater than .60 can be acceptable, as long as the scale is (a) short (i.e., less than 10 items) and (b) supported by theoretical or practical evidence. The Effortful Healing subscale meets these criteria as it (a) contains only three items and (b) was developed based on descriptions of rehabilitation overadherence in the previous literature (Granquist et al., 2014). As a result, the Effortful Healing subscale was retained in subsequent analyses, with the caveat that results pertaining to this subscale were viewed with caution.

Univariate and multivariate outliers. Tests to screen for univariate and multivariate outliers were conducted for each subscale of the SIROS and Sport MPS-2, as well as each of the

covariates. To screen for univariate outliers, participants' mean subscale scores and control variable scores were converted to z-scores. Cases that had a z-score more than 3 standard deviations above or below the mean (i.e., a z-score outside the range of ± 3.29) were labelled as univariate outliers (Tabachnik & Fidell, 2013). Five cases met this criterion. One case had an extreme score for a SIROS Expedited Rehabilitation subscale, with a z-score of -3.41. The remaining four cases had extreme scores on covariate variables assessed by the demographics questionnaire. One had an extreme score for the length of time since the injury occurred ($z = 4.15$), one with an extreme score for the length of time spent rehabilitating the current injury ($z = 7.41$), one with an extreme score for the time spent participating in sport/week ($z = 3.46$), one with extreme scores for the length of time since the injury occurred ($z = 6.21$), and for the length of time spent rehabilitating the current injury ($z = 7.67$). These cases were excluded from the dataset before screening for multivariate outliers.

To screen for multivariate outliers, Mahalanobis D^2 values were calculated. One value was based on mean scores across the four subscales of the SIROS, one based on mean scores across the three subscales of the Sport MPS-2, and one for the potential covariates of rehabilitation overadherence assessed by the demographics questionnaire. The probability of the D^2 values were then computed and these values were used to screen for multivariate outliers. A case was considered a multivariate outlier if the probability of the Mahalanobis D^2 score was less than .001 (Tabachnik & Fidell, 2013). No cases met this criterion. As a result, all subsequent analyses were based on the dataset that excluded the five univariate outliers (i.e., $n = 75$).

Bivariate correlations. Table 7 presents the bivariate correlations between the overadherence risk factors as measured by the SIROS subscales, the perfectionism dimensions as measured by the Sport-MPS-2 subscales, and the demographic covariates. The correlations

provided initial insight into relationships between the predictor variables (i.e., personal standards perfectionism and evaluative concerns perfectionism) and the outcome variables (i.e., risk factors of sport injury rehabilitation overadherence). In regard to the relationships between perfectionism and rehabilitation overadherence, personal standards perfectionism and evaluative concerns perfectionism were both significantly positively correlated with Inclinations to Overadhere ($r = .32$; $r = .39$) and Normalization of Pain ($r = .29$; $r = .41$), respectively. No significant bivariate correlations were present between the dimensions of perfectionism and Expedited Rehabilitation or Effortful Healing.

Table 7

Bivariate Correlations between Overadherence Risk Factors, Perfectionism Dimensions, and Covariates

Variable	Overadherence Risk Factors				Perfectionism Dimensions		Demographic Covariates										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Overadherence Risk Factors																	
1. ITO																	
2. ER	.38**																
3. EH	.13	.01															
4. NOP	.47**	.18	.28*														
Perfectionism Dimensions																	
5. PS	.32**	.20	.10	.29*													
6. EC	.39**	.06	.21	.41**	.49**												
Demographic Covariates																	
7. Gender	.15	.07	-.13	0.01	.08	-.06											
8. Age	.05	-.07	-.05	.05	-.30**	.05	-.02										
9. Sport Length	.18	-.25*	-.11	-.08	-.12	.14	.12	.63**									
10. Competition Level	.20	.36**	-.01	.01	.46**	.11	.11	-.38**	-.19								
11. Sport Participation	.04	.17	.12	.16	.47**	.17	.01	-.51**	-.38**	.58**							
12. Injury Onset	-.02	-.04	.08	.07	.07	-.24*	-.06	-.06	-.05	.06	.27*						
13. Surgery	-.03	.13	-.13	.04	-.04	-.05	.12	.24*	.23*	.14	-.08	.10					
14. Sport Restriction	-.26*	-.09	-.16	-.39**	-.18	.02	-.01	.03	.09	-.23*	-.19	-.36**	-.19				
15. Injury Length	-.25*	-.50*	.08	.05	.09	-.03	-.23*	-.10	-.04	-.19	-.04	.27*	-.20	-.25*			
16. Rehab Length	-.20	-.45**	.04	.03	.05	-.10	-.28*	-.07	-.00	-.20	.01	.32**	-.22	-.15	.80**		
17. Appointments	-.01	-.07	-.09	.05	.22	.06	-.28*	-.20	-.14	.03	.28*	.15	-.19	.00	.35**	.49**	

Note. ITO: Inclinations to Overadhere. ER: Expedited Rehabilitation. EH: Effortful Healing. NOP: Normalization of Pain. PS: Personal Standards. EC: Evaluative Concerns. Gender: 1 = female, 2 = male. Sport Length: average length of time spent playing sport(s). Competition Level: average level of sport(s) competition. Sport Participation: average days spent playing sport(s)/week. Injury Onset: whether injury occurred suddenly or gradually. Surgery: whether surgery was (or will be) required for current injury. Sport Restriction: the degree to which sport(s) participation was restricted by current injury. Injury Length: length of time (weeks) since occurrence of current injury. Rehabilitation Length: length of time (weeks) respondent has been rehabilitating current injury. Appointments: number of rehabilitation appointments attended for current injury. *p < 0.05. **p < 0.01.

In line with previous research, personal standards and evaluative concerns perfectionism were significantly correlated (r = .49; Madigan, Stoeber, & Passfield, 2017). Strong correlations between predictor variables introduced concerns over multicollinearity, since shared variance between predictor variables could lead to distorted or less generalizable results in regression analyses (Hayes, 2013). To address this concern, tests of multicollinearity (i.e., VIF) were conducted. A VIF value greater than 10 suggests problematic multicollinearity (Hair, Black, Babin, & Anderson, 2010). The VIF values produced for the present analyses did not exceed 1.46 indicating that multicollinearity was not a concern.

Multiple Regression Analysis

As indicated in the data analysis sub-section of the Method, multiple regression analyses were conducted to examine the interactive effects of personal standards perfectionism and evaluative concerns perfectionism on each rehabilitation overadherence risk factor. If the coefficient associated with the interaction term was statistically significant, the interaction effects were examined by providing a visual interpretation and conducting simple slopes analysis. If no interaction effect was detected, the regression was re-run to more appropriately test for main effects involving personal standards perfectionism and evaluative concerns perfectionism. If main effects were still present after re-running the regression, the effects were examined by providing a visual interpretation and examining the general trends. The following sections describe the results of the regression analysis pertaining to each overadherence risk factor. Table 8 summarizes the results from the final regression equation used to predict the respective overadherence risk factor.

Table 8

Coefficients from the Final Regression Equation Used to Predict Each Rehabilitation Overadherence Risk Factor

	Overadherence Risk Factors											
	Expedited Rehabilitation			Effortful Healing			Inclinations to Overadhere			Normalization of Pain		
Variables	*B*	SE	*t*	*B*	SE	*t*	*B*	SE	*t*	*B*	SE	*t*
Demographic Covariates												
Gender	-0.09	0.19	-0.10	-0.22	0.24	-0.90	0.14	0.20	0.70	0.08	0.19	0.40
Age	0.01	0.01	1.12	0.00	0.02	0.02	-0.01	0.01	-0.92	0.02	0.01	1.11
Sport Length	-0.03*	0.01	-2.42	-0.01	0.02	-0.59	0.02	0.01	1.87	-0.03	0.02	-1.58
Competition Level	0.17	0.11	1.57	-0.09	0.14	-0.63	0.09	0.11	0.84	-0.21	0.12	-1.78
Sport Participation	-0.05	0.06	-0.90	0.05	0.08	0.62	-0.13*	0.06	-2.16	0.04	0.07	0.56
Injury Onset	0.04	0.19	0.22	0.13	0.27	0.48	0.25	0.19	1.29	-0.05	0.26	-0.18
Surgery	-0.00	0.22	-0.01	-0.21	0.31	-0.69	-0.34*	0.13	-2.65	0.05	0.35	0.15
Sport Restriction	-0.07	0.06	-1.06	-0.09	0.08	-1.15	-0.23**	0.07	-3.21	-0.25**	0.08	-3.04
Injury Length	-0.00	0.00	-1.33	-0.00	0.00	-0.04	-0.00*	0.00	-2.31	-0.00	0.00	-0.61
Rehabilitation Length	-0.00	0.00	-0.19	0.00	0.00	0.24	0.00	0.00	0.25	0.00	0.00	0.45
Appointments	-0.00	0.00	-0.19	-0.01	0.00	-1.16	0.00	0.00	1.50	-0.00	0.00	-0.03
Primary Variables												
PS	0.16	0.13	1.23	-0.02	0.20	-0.13	0.12	0.12	0.93	0.05	0.14	0.35
EC	-0.00	0.08	-0.10	0.13	0.14	0.92	0.17*	0.08	2.09	-0.21*	0.09	2.36
PS × EC	—	—	—	-0.01	0.05	-0.28	—	—	—	-0.07*	0.04	-2.11
R^2 total	0.44**			0.16			0.47**			0.42**		

Note. B: unstandardized regression coefficients. Sport Length: average length of time spent playing sport(s). Competition Level: average level of sport(s) competition. Sport Participation: average days spent playing sport(s)/week. Injury Onset: whether injury occurred suddenly or gradually. Surgery: whether surgery was (or will be) required for current injury. Sport Restriction: the degree to which sport(s) participation was restricted by current injury. Injury Length: length of time (weeks) since occurrence of current injury. Rehabilitation Length: length of time (weeks) respondent has been rehabilitating current injury. Appointments: number of rehabilitation appointments with primary rehabilitation practitioner for current injury. PS: Personal Standards. EC: Evaluative Concerns. *$p < 0.05$. **$p < 0.01$

Expedited Rehabilitation. The regression analysis explained a significant amount of variance when Expedited Rehabilitation served as the dependent variable ($R^2 = 0.45$, $F(14, 60) = 2.71$, $p < .01$). In the resulting regression equation, the coefficient associated with the interaction term was not significant ($\beta = .05$, $p = .39$). As a result, the interaction term was removed, and the regression was re-run to more appropriately test for main effects involving personal standards perfectionism and evaluative concerns perfectionism The resulting regression equation explained a significant amount of variance ($R^2 = 0.44$, $F(13, 61) = 2.76$, $p < .01$). The coefficients associated with personal standards ($\beta = .15$, $p = .20$) and evaluative concerns ($\beta = .00$, $p = .97$) were both not significant. These results indicate that neither personal standards perfectionism nor evaluative concerns perfectionism significantly predicted Expedited Rehabilitation.

Effortful Healing. The regression analysis did not explain a significant amount of variance when Effortful Healing served as the dependent variable ($R^2 = 0.16$, $F(14, 60) = 0.69$, $p = .77$). As a result, the model was not investigated further for interaction or main effects involving personal standards perfectionism or evaluative concerns perfectionism.

Inclinations to Overadhere. The regression analysis explained a significant amount of variance when Inclinations to Overadhere served as the dependent variable ($R^2 = 0.47$, $F(14, 60) = 7.06$, $p < .01$). In the resulting regression equation, the coefficient associated with the interaction term was not statistically significant ($\beta = -.02$, $p = .74$). As a result, the interaction term was removed, and the regression was re-run to more appropriately test for main effects involving personal standards perfectionism and evaluative concerns perfectionism (Gaudreau, 2012). The resulting regression equation explained a significant amount of variance in predicting Inclinations to Overadhere ($R^2 = 0.47$, $F(13, 61) = 7.76$, $p < .01$). The coefficient associated with evaluative concerns was significant and positive ($\beta = .17$, $p < .05$) indicating that increases in

evaluative concerns were associated with increases in Inclinations to Overadhere. The coefficient associated with personal standards was not significant ($\beta = .12$, $p = .36$). Figure 2 illustrates this pattern of results and identifies which hypotheses of the 2×2 model of perfectionism were supported as a result (Gaudreau, 2012). The non-significant main effect for personal standards indicated that non-perfectionism was not associated with significantly different levels of Inclinations to Overadhere as compared to pure evaluative concerns perfectionism (failing to support Hypotheses 1a and 1b) and that mixed perfectionism was not associated with significantly different levels of Inclinations to Overadhere than pure evaluative concerns perfectionism (failing to support Hypothesis 3). Given the assumption that Inclinations to Overadhere is negatively-laden (i.e., leads to negative outcomes), the positive main effect for evaluative concerns indicates that pure evaluative concerns perfectionism was associated with greater levels of Inclinations to Overadhere as compared to non-perfectionism (supporting for Hypothesis 2) and that mixed perfectionism was associated with greater levels of Inclinations to Overadhere as compared to pure personal standards perfectionism (supporting Hypothesis 4).

Figure 2. Mean Inclinations to Overadhere scores as predicted by evaluative concerns perfectionism at low (-1 SD) and high (+1 SD) levels of personal standards perfectionism. Evaluative concerns and personal standards perfectionism scores are standardized. H1-H4 refer to the four hypotheses of the 2 × 2 model. * denotes support for a hypothesis.

Normalization of Pain. The regression analysis explained a significant amount of variance when Normalization of Pain served as the dependent variable ($R^2 = 0.42$, $F(14, 60) = 5.25$, $p < .01$). In the resulting regression equation, the coefficient associated with the interaction term was statistically significant ($\beta = -.07$, $p < .05$). This indicated that personal standards and evaluative concerns significantly interacted to predict Normalization of Pain. This interaction is illustrated in Figure 3. Figure 3 presents an attenuated interaction, where the effect of evaluative concerns is weakened by higher levels of personal standards. In other words, evaluative concerns

perfectionism was positively associated with Normalization of Pain, but this relationship was more prominent at low levels of personal standards as compared to high levels. Results produced by the Johnson-Neyman technique indicated that the relationship between evaluative concerns and Normalization of Pain was significant when personal standards scores were less than 0.39 standard deviations above the mean, but the relationship was not significant at higher levels of personal standards.

Four simple slopes were calculated to evaluate the degree to which this interaction supported the hypotheses of the 2×2 model of perfectionism (see Figure 3). The first simple slope tested the effect of personal standards at low levels of evaluative concerns. This effect was not significant ($m = .17$, $p = .24$) and, as a result, did not support Hypothesis 1 of the 2×2 model. This result suggested that non-perfectionism was not associated with significantly different levels of Normalization of Pain as compared to pure evaluative concerns perfectionism. The second simple slope tested the effect of personal standards at high levels of evaluative concerns. This effect was not significant ($m = -.07$, $p = .66$) and, therefore, did not support Hypothesis 3. This result suggested that pure evaluative concerns perfectionism was not associated with significantly greater levels of Normalization of Pain as compared to mixed perfectionism. The third simple slope tested the effects of evaluative concerns on low levels of personal standards. This effect was significant ($m = .28$, $p < .01$) and, as a result, supported Hypothesis 2 of the model. The fourth simple slope tested the effects of evaluative concerns at high levels of personal standards. This effect was non-significant ($m = .13$, $p = .18$) and, therefore, did not support Hypothesis 4 of the 2×2 model.
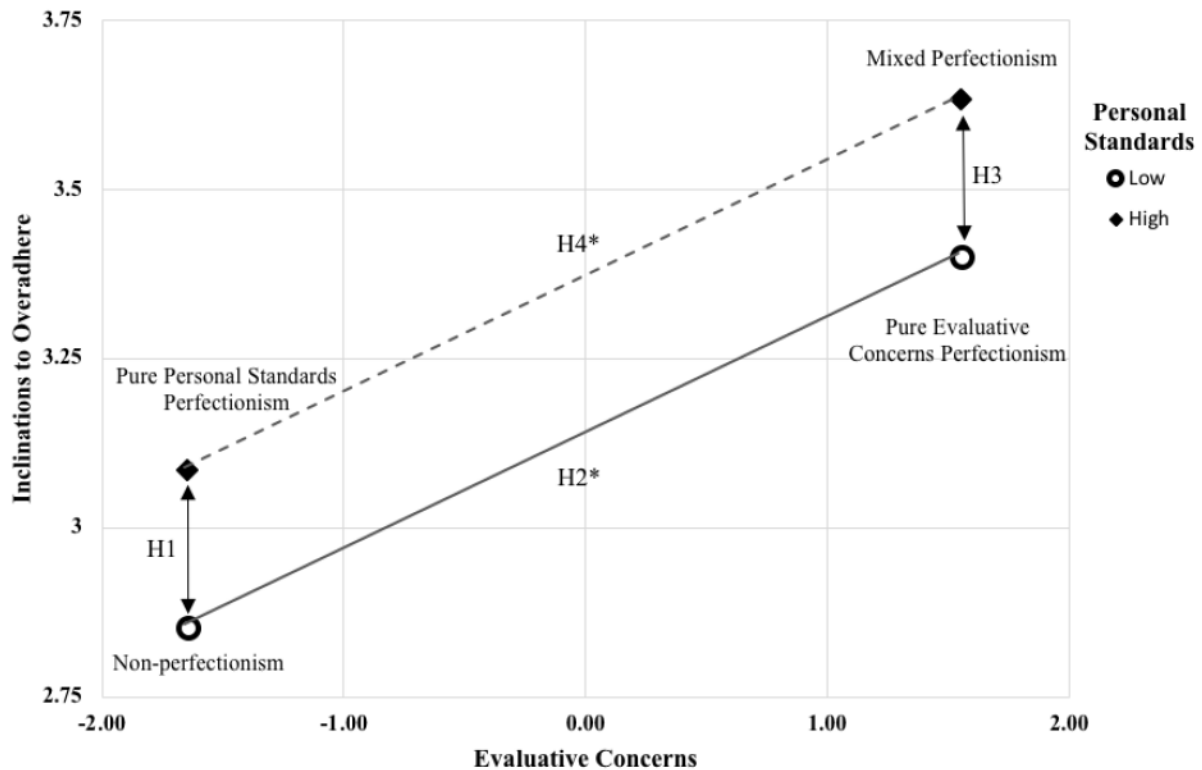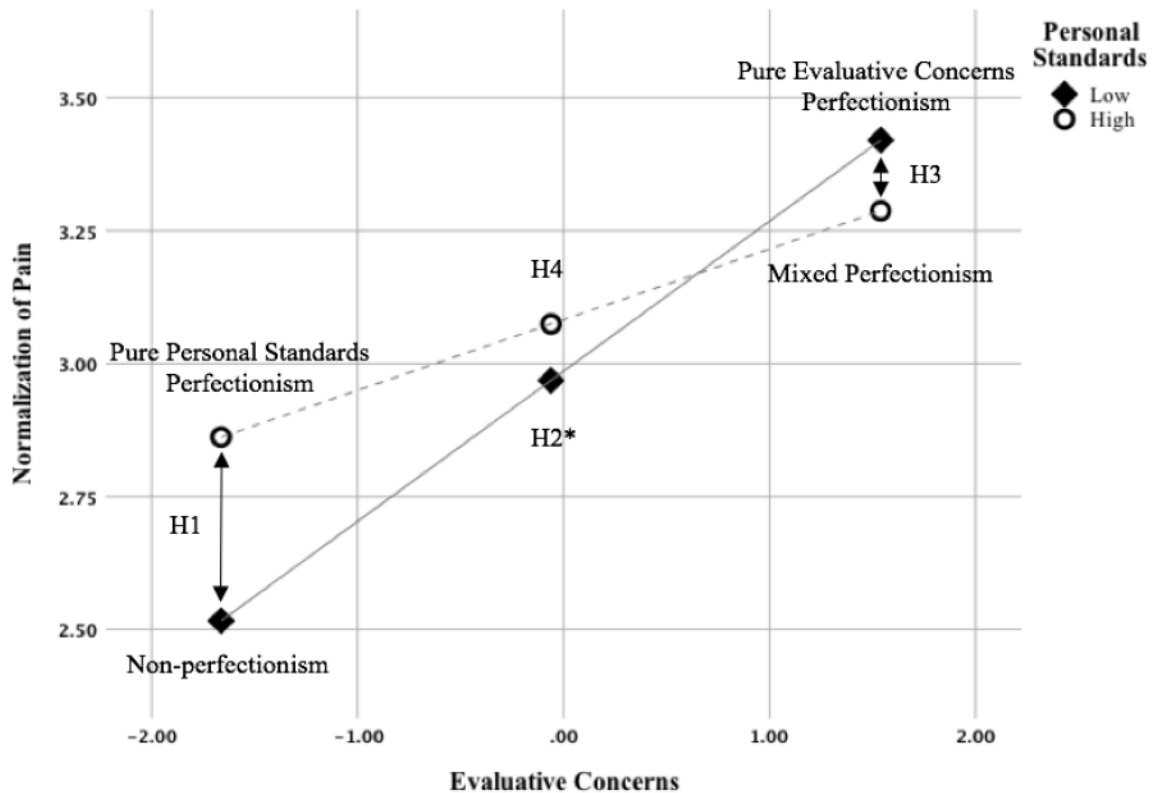
Figure 3. Mean Normalization of Pain scores as predicted by evaluative concerns perfectionism at low (-1 SD) and high (+1 SD) levels of personal standards perfectionism. Evaluative concerns and personal standards perfectionism scores are standardized. H1-H4 refer to the four hypotheses of the 2 × 2 model. * denotes support for a hypothesis.

Discussion

The purpose of this study was to examine the relationship between sport perfectionism and risk factors of sport injury rehabilitation overadherence among injured athletes, using the 2 × 2 model of perfectionism as a conceptual framework. These athletes were restricted in their sport participation as a result of an injury and currently receiving treatment for that injury with a rehabilitation practitioner (e.g., physiotherapist, chiropractor, athletic therapist). It was expected that subtypes of perfectionism defined by the 2 × 2 model would differentially predict

rehabilitation overadherence risk factors. Specifically, it was expected that pure evaluative concerns perfectionists would be at the greatest risk for rehabilitation overadherence, followed by mixed perfectionists, pure personal standards perfectionists; lastly, non-perfectionists were expected to be at the lowest risk for rehabilitation overadherence. A series of multiple regression analyses indicated that perfectionism predicted two rehabilitation overadherence risk factors, Inclinations to Overadhere and Normalization of Pain, but not Expedited Rehabilitation and Effortful Healing. The following sections provide a discussion about how these findings relate to past research and potential explanations as to why perfectionism predicted some risk factors but not others.

Subtypes of Perfectionism and Sport injury Rehabilitation Overadherence

Expedited Rehabilitation and Effortful Healing. Perfectionism did not significantly predict Expedited Rehabilitation and Effortful Healing as risk factors of rehabilitation overadherence, therefore, failing to support the four expected hypotheses. Furthermore, bivariate correlations between the higher order dimensions of perfectionism and these two risk factors were not significant. In terms of the Expedited Rehabilitation risk factor, this finding indicated that injured perfectionistic athletes did not present desires to rush their injury rehabilitation in order to return to their sport sooner. This was unexpected, given that athletes who are perfectionistic toward their sport achievement are characteristically devoted to achieving high standards in sport, and likely prioritize a prompt return to sport (Hill, Witcher et al., 2015). In general, athletes' primary reason for adhering to injury rehabilitation is to return to sport (Hilliard et al., 2016). Perfectionistic athletes might be particularly motivated to do so, given their compulsive drive to always improve and work towards goals in sport (Hill, Witcher et al.,

2015). According to this characteristic, it was expected that perfectionists would be driven, not only to return to sport, but also to return to their pre-injury standards of play.

Given their drive to succeed in sport (Hill, Witcher et al., 2015), returning to sport is likely a priority for perfectionistic athletes. It is possible, though, that perfectionists might actually demonstrate a healthy adherence to rehabilitation, since returning to sport is important to them. Perhaps perfectionistic athletes understand that sport injury rehabilitation is a tool that aids in their return to sport participation and takes them a step closer to returning to reaching their pre-injury standards. As a result, those athletes might avoid overdoing recommended protocols and adhere to any recommended restrictions in an attempt to avoiding re-injury or prolonging the rehabilitation process. In other words, perfectionistic athletes may attempt to rehabilitate their injury *perfectly* in an effort to return to their usual standard of play as efficiently as possible.

Another explanation for this finding is that perfectionists may be anxious about returning to full sport participation. Although returning to sport is an exciting accomplishment for athletes recovering from injury, it is common to experience anxieties and concerns related to re-injury and ability to return to pre-injury standards of performance (Podlog, Heil, & Shulte, 2014). These anxieties are thought to be further exacerbated in athletes who have unrealistic performance expectations for their return to sport (Podlog & Eklund, 2007; Ruddock-Hudson, O'Halloran & Murphy, 2014). Perfectionists might be particularly vulnerable to anxieties related to a return to sport, given that they characteristically employ a rigid all-or-nothing view towards success (Hill, Witcher et al., 2015), are prone to performance-related anxieties (Hamidi & Besharat, 2010), and may be concerned over appearing imperfect in front of coaches and teammates (Hewitt et al., 2003). As a result, if perfectionists do not perceive their recovery to be at 100%, they may experience anxieties over returning to competition and over how others will

judge their performance. This could in turn make them less motivated to expedite their rehabilitation and return to sport sooner than recommended.

In terms of the Effortful Healing subscale, these findings indicated that injured perfectionistic athletes did not perceive that greater effort towards injury rehabilitation would result in better rehabilitation outcomes. This is surprising, given that perfectionists characteristically view hard work and effort as a determinant of success and feel that they have failed if they did not give something their all (Gotwals & Spencer-Cavaliere, 2014; Hill, Witcher et al., 2015; Sellars et al., 2016). Past research has linked perfectionism with exerting excessive effort towards achievement in the form of overtraining (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017) and exercise dependence (Costa et al., 2016; Hill, Robson, & Stamp, 2015). Based on these findings, it seems reasonable to assume that injured athletes with this mentality might apply the same effort towards their sport injury rehabilitation and only perceive it to be successful if they have put forth their full effort.

The finding that perfectionism was not associated with Effortful Healing as a risk factor of rehabilitation overadherence contradicts findings of past research. This contradiction could be a matter of context (Flett & Hewitt, 2014; Flett & Hewitt, 2016). Sport injury rehabilitation is a dynamic process that can be filled with unpredictable fluctuations of progress and setbacks (Arvinen-Barrow & Hemmings, 2013). Perfectionism might be a vulnerability factor in such a setting, given that some perfectionists perceive setbacks as personal failures (Gotwals & Spencer-Cavaliere, 2014). Furthermore, perfectionistic athletes might be even more susceptible to other typical stressors associated with injury rehabilitation, such as external pressures to return to sport, concerns over reaching pre-injury standards, or potentially losing a spot on the team (Podlog et al., 2011; Podlog & Eklund, 2006). While perfectionistic athletes often cope with

stressful situations by exerting efforts towards fixing the problem (i.e., Effortful Healing), another common coping strategy implemented by perfectionistic athletes involves efforts to disengage from and avoid stressful situations (Crocker, Gaudreau, Mosewich, & Kljajic, 2014; Gaudreau & Antl, 2008; Hill, Hall, & Appleton, 2010; Nicholls, 2010). Such avoidance coping strategies are often utilized in situations where, much like sport injury rehabilitation, athletes perceive a large discrepancy between the current demands of the stressor and their ability to handle them (Nicholls, 2010). Perfectionists might be particularly vulnerable to using these strategies during rehabilitation, since injury creates a large discrepancy between their current abilities and their high performance expectations. As a result, it is likely that perfectionistic athletes might be susceptible to using avoidance coping strategies to combat the stress associated with their sport injury rehabilitation. This could lead them to disengage and decrease their efforts towards injury rehabilitation, explaining the absence of a relationship between perfectionism and Effortful Healing.

Inclinations to Overadhere. A significant main effect for evaluative concerns perfectionism indicated that pure evaluative concerns perfectionism was associated with greater Inclinations to Overadhere as compared to non-perfectionism (supporting Hypothesis 2 of the 2 × 2 model) and that mixed perfectionism was associated with greater Inclinations to Overadhere as compared to pure personal standards perfectionism (supporting Hypothesis 4 of the 2 × 2 model). These results suggest that injured athletes with high levels of evaluative concerns perfectionism are likely to express inclinations to exceed the frequency, intensity, and amount of prescribed home exercises, and re-engage in sport earlier, and/or at a higher intensity than recommended, putting them at increased risk for rehabilitation overadherence.

The finding that pure evaluative concerns perfectionists are at a greater risk for Inclinations to Overadhere as compared to non-perfectionists is in line with expectations based on past research. Evaluative concerns perfectionism is associated with a greater incidence of injury (Madigan, Stoeber, Forsdyke, et al., 2017), which suggests that these athletes may be more inclined to push themselves too far and sacrifice their bodies in order to succeed in sport. Evaluative concerns are also associated with tendencies to strive excessively towards achievement in the form of exercise dependence (Costa et al., 2016; Hill, Robson, & Stamp, 2015) and overtraining (Madigan Stoeber, & Passfield, 2017; Madigan et al., in press). Based on these findings, the high levels of evaluative concerns present in pure evaluative concerns perfectionists seem to be associated with inclinations to overstrive in training and exercise. It is not surprising then, that pure evaluative concerns perfectionists also seem to be inclined to overstrive as they rehabilitate an injury, whereas non-perfectionists, with low levels of evaluative concerns, do not exhibit those same inclinations.

The finding that mixed perfectionists were at a greater risk for Inclinations to Overadhere as compared to pure personal standards perfectionists was also expected based on past research. Pure personal standards perfectionists are motivated toward high standards for more intrinsic reasons and still take satisfaction from their efforts, even if they experience mistakes or setbacks (Gotwals & Spencer-Cavaliere, 2014). On the other hand, mixed perfectionists have a self-worth that is dependent on performing well in sport and experience external pressures from others to excel in sport (Gotwals & Spencer-Cavaliere, 2014). As a result, mixed perfectionists might be more inclined to exceed practitioner recommendations as compared to pure personal standards perfectionists, in an attempt to fulfill their self-worth and satisfy external pressures to return to sport participation.

Normalization of Pain. A significant interaction effect between personal standards perfectionism and evaluative concerns perfectionism indicated that evaluative concerns perfectionism positively predicted injured athletes' tendencies to normalize the experience of pain during injury rehabilitation; this relationship, however, was not as prominent at high levels of personal standards of perfectionism. Only one of the proposed hypotheses was supported for this relationship. Pure evaluative concerns perfectionism was associated with significantly greater Normalization of Pain than non-perfectionism (supporting Hypothesis 2 of the 2×2 model). Although the simple slopes values testing Hypotheses 1a, 1b, 3, and 4 were not significant, the overall regression results still indicated that personal standards perfectionism had a somewhat protective, buffering effect.

The finding that pure evaluative concerns perfectionism was associated with greater Normalization of Pain as compared to non-perfectionism was anticipated, given that perfectionists with high levels of evaluative concerns tend to be overly critical of negative evaluation from others and perceive pressures to reach certain standards (Hewitt & Flett, 1991). As a result, these athletes may be overly concerned with what coaches, teammates, and opponents think of them when they are injured and cannot compete in sport, and as a result, try to present themselves in a more desirable manner. Injured athletes with high levels of evaluative concerns may demonstrate behaviours consistent with the dominant sport ethic by normalizing and pushing through symptoms of pain during injury rehabilitation in order to appear more tough or athletic. Pushing through pain is not only expected of athletes but is considered necessary to succeed in sport (Curry, 1993; Frey, 1991). The high levels of evaluative concerns present in pure evaluative concerns perfectionists might make them more likely than non-perfectionists to exhibit tendencies to normalize and push through pain during injury rehabilitation in an attempt

to maintain an impression of athleticism in front of coaches, teammates, or rehabilitation practitioners.

The negative role of evaluative concerns perfectionism in predicting Normalization of Pain is consistent with the present findings that evaluative concerns perfectionism predicts injured athlete's Inclinations to Overadhere to injury rehabilitation. A unique finding to the Normalization of Pain risk factor, however, was that personal standards perfectionism may play a somewhat positive and protective role in predicting injured athletes' tendencies towards normalizing pain associated with injury rehabilitation. Specifically, at higher levels of personal standards, the negative effect of evaluative concerns was less prominent (see Figure 3 for a visual depiction of this relationship). Furthermore, the conditional effect of evaluative concerns on Normalization of Pain was only present from low to moderately high levels of personal standards. At higher levels of personal standards, the conditional relationship between evaluative concerns and Normalization of Pain was not significant. This suggests that high levels of personal standards are protective against the negative influence of evaluative concerns. This finding is in line with previous research which indicated that high levels of personal standards is protective against the negative effect of evaluative concerns on the relationship between perfectionism and overtraining (Madigan, Stoeber, & Passfield, 2017). Although overtraining and Normalization of Pain are conceptually different constructs, both represent an excessive form of striving to push through discomfort in order to improve. Based on personal standards' role in each of these constructs, it is possible that injured athletes with high levels of personal standards will have a more healthy, flexible striving towards their injury rehabilitation.

Summary of Findings

The present study examined whether personal standards perfectionism and evaluative concerns perfectionism predicted risk factors of sport injury rehabilitation overadherence, using the 2×2 model of perfectionism as a conceptual framework. Results for Inclinations to Overadhere provided support for Hypotheses 2 and 4. A positive main effect for evaluative concerns indicated that pure evaluative concerns perfectionism was associated with greater Inclinations to Overadhere as compared to non-perfectionism (supporting Hypothesis 2), and mixed perfectionism was associated with greater levels of Inclinations to Overadhere as compared to pure personal standards perfectionism (supporting Hypothesis 4). Results for Normalization of Pain provided further support for Hypothesis 2, since pure evaluative concerns perfectionism was associated with greater Normalization of Pain as compared to non-perfectionism.

Support for Hypothesis 2 suggested that the relative presence of evaluative concerns perfectionism in pure evaluative concerns perfectionism compared to non-perfectionism is a risk factor for injured athletes going through rehabilitation. High levels of evaluative concerns perfectionism put athletes at greater risk for expressing inclinations to overdo practitioner recommendations and tendencies to normalize pain associated with injury rehabilitation. On the other hand, support for Hypothesis 4 suggested that the relative absence of evaluative concerns perfectionism in pure personal standards compared to mixed perfectionism lead to more positive injury rehabilitation outcomes. Low levels of evaluative concerns perfectionism were found to lead to a lower risk for expressing inclinations to overadhere to practitioner recommendations.

Taken together, current findings consistently allude to the negative influence of evaluative concerns perfectionism over injured athlete's tendencies and inclinations during their

injury rehabilitation. Injured athletes with high levels of evaluative concerns perfectionism are at a greater risk for accepting pain as a regular part of their rehabilitation and simply pushing through it. They are also at a greater risk to express desires to exceed practitioner recommendations and/or re-engage in sport earlier or at a higher intensity than recommended. This is not surprising, given that evaluative concerns perfectionism has also played a consistent role in predicting other excessive forms of overstriving such as exercise dependence (Costa et al., 2016; Hill, Robson, & Stamp, 2015) and overtraining (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017).

The lack of support for Hypothesis 1a, 1b, and 3 were somewhat unexpected, but not entirely surprising. These hypotheses tested whether the relative presence of personal standards perfectionism was beneficial (Hypothesis 1a) or maladaptive (Hypothesis 1b) and whether the generally positive influence of high personal standards would offer a protective effect over the negative influence of high evaluative concerns (Hypothesis 3). A lack of support for these hypotheses alluded to the ambiguous role that personal standards perfectionism plays in achievement behaviours. The controversial role of personal standards perfectionism is also apparent in research predicting exercise dependence and overtraining. Components of personal standards perfectionism are sometimes adaptive, leading to lower levels of overstriving in the form of exercise dependence (Hill, Robson, & Stamp, 2015), but sometimes maladaptive, leading to higher levels of overstriving in the form of overtraining (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017). The outcomes of perfectionism are context-specific (Flett & Hewitt, 2014; 2016) and it is possible that high personal standards are advantageous under some conditions, but not others (Gaudreau et al., 2017). Future research is needed to examine

under what conditions personal standards perfectionism leads to better (Hypothesis 1a) or worse (Hypothesis 1b) outcomes as compared to non-perfectionism.

Initial Reliability and Validity Evidence of the SIROS

The only existing measure of rehabilitation overadherence, the ROAQ, has demonstrated questionable evidence of reliability and validity (Hilliard et al., 2016; Podlog et al., 2013). To address this, the SIROS was developed, based on theoretical descriptions of rehabilitation overadherence in the literature, to assess risk factors of rehabilitation overadherence (Granquist et al., 2014; Niven, 2007; Podlog et al., 2013). It should be recognized that the SIROS is a newly developed measure without any established evidence of reliability and validity. The current study addressed this by examining internal consistencies of each subscale and the degree to which each subscale showed theoretically meaningful relationships with perfectionism.

Results of the tests of internal consistency for Inclinations to Overadhere ($\alpha = .85$), Expedited Rehabilitation ($\alpha = .86$), and Normalization of Pain ($\alpha = .87$) were well above the Cronbach's alpha values of .70. The internal consistency for Effortful Healing ($\alpha = .64$), however, fell below this recommended value. Cronbach's alpha values greater than .60 are considered acceptable, however, for subscales that contain fewer than 10 items and are also supported by theoretical or practical evidence (Loewenthal, 2001). The Effortful Healing subscale met both of these criteria, since it contains only three items, and was developed based off theoretical descriptions of rehabilitation overadherence from the literature (Granquist et al., 2014; Niven, 2007; Podlog et al., 2013). Future research should establish further evidence of the reliability of the SIROS by re-examining the internal consistencies of the subscales with different populations and by exploring the test-retest reliability to determine whether scores of the SIROS are stable across time.

Evidence of external validity for the SIROS was provided by exploring its expected relationships with multidimensional sport perfectionism. Two subscales demonstrated theoretically expected relationships with perfectionism. Evaluative concerns perfectionism positively predicted Inclinations to Overadhere. This finding was expected based on available research indicating that perfectionists are inclined to overdo efforts in other contexts such as training (Costa et al., 2016; Hill, Robson, & Stamp) and exercise (Madigan et al., in press; Madigan, Stoeber, & Passfield, 2017). Personal standards and evaluative concerns perfectionism interacted to positively predict Normalization of Pain. This finding was expected based on research that reported that perfectionists might try to present themselves in a more desirable manner (Hewitt et al., 2003), and, as a result, may normalize symptoms of pain in order to maintain an appearance of athleticism while they are injured and cannot compete in their sport. Perfectionism did not, however, predict Expedited Rehabilitation. This is surprising, given that perfectionists are characteristically driven to always improve and work towards goals in sport (Hill, Witcher et al., 2015), but could be explained by perfectionists' attempts to perfectly adhere to their injury rehabilitation and anxieties about returning to sport before they are back to 100% (Hill, Witcher et al., 2015). Perfectionism also failed to predict Effortful Healing. Again, this is surprising, given that perfectionists characteristically view hard work and effort as necessary to success (Gotwals & Spencer-Cavaliere, 2014), but could be explained by perfectionists' tendencies to cope with stress by avoiding demonstrating any effort towards stressful situations (Crocker et al., 2014).

This study established initial reliability and validity evidence of the SIROS, but more is needed to further substantiate the measure. Further evidence of internal validity is needed. A confirmatory factor analysis would be beneficial to investigate the current structure of the

suggested rehabilitation overadherence risk factors. Additionally, an official item evaluation using a panel of expert judges would help to assess the relevance and representativeness of the items. This panel of experts could include a combination of professionals with practical experience related to sport injury rehabilitation, or individuals who have extensive experience researching in the field of sport injury rehabilitation. Evidence of convergent validity should be further investigated by exploring the relationship between risk factors of rehabilitation overadherence and theoretically-related constructs. The SIROS has potential to be a valuable instrument that could be applied in future research or for use in a clinical sport injury rehabilitation setting. Additional evidence of reliability and validity is necessary, however, in order to develop more faith in the instrument's assessments of rehabilitation overadherence risk factors.

Predictors of Sport injury Rehabilitation Overadherence

Sport injury rehabilitation behaviours such as rehabilitation overadherence are impacted by a number of compounding factors (Wiese-Bjornstal et al., 1998). In this study, perfectionism was identified as a predictor of rehabilitation overadherence risk factor. Sport injury rehabilitation is an extremely variable process, though, and a number of other factors can play a role in predicting injury rehabilitation overadherence (Granquist et al., 2014; Niven, 2007). Several demographic variables tested as covariates in this study were found to be significant predictors of rehabilitation overadherence. The highest level of competition athletes competed at prior to injury was positively related to Expedited Rehabilitation. This indicated that athletes who competed at higher levels of competition were more likely to have desires to rush their injury rehabilitation in order to return to sport sooner. This is supported by past research indicating that elite athletes who are more committed to their sport might be more likely to

overadhere to injury rehabilitation in order to return to sport sooner (Granquist et al., 2014; Niven, 2007). The length of time since the occurrence of the current injury was negatively associated with Inclinations to Overadhere and Expedited Rehabilitation. This indicated that the more severe the injury, the more likely athletes were to overadhere to practitioner recommendations and rush their rehabilitation. On the other hand, sport restriction was a negative predictor of Inclinations to Overadhere. This indicated that the less restricting the injury, the more likely athletes were to have intentions of overdoing practitioner recommendations. Past literature also showed opposing opinions to whether greater injury severity would lead to higher or lower levels of rehabilitation adherence (Granquist et al., 2014). Athletes with severe injuries could take their injury rehabilitation more seriously, or, on the other hand, these athletes might be discouraged and lose motivation (Granquist et al., 2014). Injury length was negatively related to Inclinations to Overadhere and Expedited Rehabilitation.

Age and gender were not found to be significant predictors of any risk factor of rehabilitation overadherence. Other research, however, has suggested that these factors can impact the way that injured athletes adhere to their rehabilitation. Older athletes are suggested to be more committed to returning to sport participation and exert more effort towards their rehabilitation (Granquist et al., 2014; Podlog et al., 2013). Furthermore, males and females are thought to adhere differently to their rehabilitation, although reasons for this have not been specified (Granquist et al., 2014). Another factor that may play an important role in rehabilitation overadherence but was not assessed in this study was the trust in the athlete-practitioner relationship. If athletes have trust in their rehabilitation practitioner, understand the rationale for the treatment, and have positive attitudes towards injury rehabilitation, they are thought to better adhere to their injury rehabilitation (Hilliard et al., 2016; Niven, 2007).

Practical Implications

The current study offers several important contributions. From an academic standpoint, the current research contributes to a better understanding of rehabilitation overadherence and its associated risk factors. Limited research has directly examined rehabilitation overadherence, and no previous research has examined its relationship with personality factors such as perfectionism. This study also provides a brief insight into a number of other factors that can influence injured athletes' risk for rehabilitation overadherence. Future researchers are encouraged to explore these factors in more depth to advance our knowledge of antecedents to rehabilitation overadherence. Exploring how perfectionists behave in an injury rehabilitation context also offers a unique contribution to the field. Past perfectionism research has focused on the degree to which perfectionism leads to healthy, adaptive characteristics and outcomes in sport (Hill, 2016). Little is known, though, about how perfectionists respond in different situational contexts within sport, and more specifically, how they respond in "situations of varying control, ambiguity, and ego-involvement" (Flett & Hewitt, 2014, p. 402).

From an applied perspective, the current research could help educate a range of healthcare providers and rehabilitation practitioners including physiotherapists, athletic therapists, and chiropractors on outcomes of perfectionism during sport injury rehabilitation. Perfectionism is likely a personality trait that these practitioners commonly witness in injured athletes. It is common among competitive athletes (Gould et al., 2002) and it is also a factor that predisposes athletes to injury (Madigan, Stoeber, Forsdyke, et al., 2017). As a result, perfectionism is likely prevalent among athletes receiving treatment for various injuries. Apart from perfectionism, this study emphasized a number of potential risk factors of rehabilitation overadherence. Making practitioners aware of factors may help them to identify individuals who

are at risk to overadhere. Furthermore, the SIROS presents a tool that could potentially be used as a method to screen patients and identify those who are at risk of rehabilitation overadherence before they begin treatment. This allows practitioners an opportunity to intervene as necessary in order to promote proper adherence rates and, as a result, better overall rehabilitation outcomes.

Limitations

The current study was one of the first to directly examine rehabilitation overadherence and was the first to establish relationships between perfectionism and overadherence. The findings of this study, though, should be considered in light of its limitations. First, this study's sample included a wide range of injured athletes with a wide range of injury rehabilitation experiences. Given that this was an exploratory study, a broad sample provided evidence to how a range of factors could impact overadherence. On the other hand, the results cannot be specifically applied to any one demographic. Injured athletes are also a difficult population to recruit. As a result, it is common practice in sport injury rehabilitation research to sample a diverse population of injured athletes that play a range of different sports and are receiving treatment for a range of different injuries (Clement & Shannon, 2011; Hilliard et al., 2016; Podlog et al., 2013; Rees, Mitchell, Evans, & Hardy, 2010).

A second limitation is that this study did not assess the actual degree to which injured athletes overadhere to their rehabilitation, but rather, it assessed potential factors that put injured athletes at a greater risk for rehabilitation overadherence. As a result, findings do not indicate whether perfectionists actually overadhere to their rehabilitation, but they do indicate that perfectionists, particularly those with high levels of evaluative concerns, might be at an increased risk for overadherence. As suggested by Hilliard et al. (2016), future research should assess actual rehabilitation overadherence among athletes.

A third limitation is that this study implemented a cross-sectional research design. This method eliminated limitations of retrospective designs that can lead to biased and inaccurate responses (Brewer et al., 1991; Podlog & Eklund, 2007). A cross-sectional design eliminates the ability to interpret causation, though, meaning that although relationships were established between perfectionism and rehabilitation overadherence, we cannot conclude that the increased risk of rehabilitation overadherence was a result of their levels of perfectionism. A prospective design would be useful to establish the temporal precedence needed to interpret causation (Brewer, 2010), however, these studies require a large sample size and time commitment.

A final limitation is the use of the SIROS to measure risk factors of sport injury rehabilitation overadherence. The SIROS is a newly developed measure that presents a potential tool that could be used to identify injured athletes who are at an increased risk for overadherence before they even begin their rehabilitation. Although this study provided only preliminary evidence of reliability and validity towards the scale, more research is needed to provide further validation of this measure to have better faith in interpreting its results.

Future Directions

This study brings to light several potential future directions for research. Rehabilitation overadherence research is in its early stages and there is still much to learn about its antecedents, outcomes, and defining characteristics. Research that has directly examined rehabilitation overadherence (Hilliard et al., 2f016; Podlog et al., 2013) has relied on qualitative research describing adherence, rather than overadherence, to define the construct (Granquist et al., 2014; Niven, 2007). This literature explored rehabilitation practitioners' perceptions of athletes' adherence to sport injury rehabilitation. Although these studies provided an initial indication of the prevalence of overadherence in injury rehabilitation and briefly alluded to its defining

characteristics, the focus was on general adherence, rather than overadherence specifically. Further, these studies focused solely on the perceptions of rehabilitation practitioners, rather than the experiences of the athletes. One study explored rehabilitation adherence behaviours by exploring injured athlete's motives for adhering to sport injury rehabilitation (Hilliard et al., 2016). It would be beneficial to take this a step further and explore injured athletes' beliefs, attitudes, and tendencies towards overdoing recommended injury rehabilitation protocols (Granquist et al., 2014). This would provide evidence towards actual beliefs and tendencies of injured athletes, rather than just speculations and observations made by rehabilitation practitioners.

Given how few studies have directly examined rehabilitation overadherence, it would also be beneficial to explore other predictors of rehabilitation overadherence. Responses to sport injury rehabilitation are influenced by a number of personal factors, environmental contexts, and injury-related factors, making it a unique process for each athlete (Wiese-Bjornstal et al., 1998). It would be beneficial to explore what types of athletes are more likely to overadhere to their injury rehabilitation. Research suggests that elite athletes, athletes with "intense" personalities, and athletes who play individual sports (and long-distance runners in particular) are more likely to overadhere to practitioner recommendations (Granquist et al., 2014; Niven, 2007, p. 101). Future research should explore the role of different sports and sport types, other personality traits, as well as gender differences. Rehabilitation-related factors such as the role of the athlete-practitioner relationship and belief in the rehabilitation process may also play a large role in rehabilitation overadherence (Granquist et al., 2014). Open communication and a trusting relationship between athletes and their rehabilitation practitioners could improve athletes' belief in prescribed exercises and activity-related restrictions (Hilliard et al., 2016; Niven, 2007). As a

result, a more positive athlete-practitioner relationship could discourage injured athletes from over-complying. Lastly, injury-related factors such as injury severity and type of injury could be looked at to a greater degree. There is controversy over the potential role of injury severity and little is known about how different injuries might impact rehabilitation overadherence (Granquist et al., 2014).

This was the first study to examine the relationship between perfectionism and rehabilitation overadherence and more research is needed to further establish this relationship. It would be particularly beneficial to examine potential moderators of the perfectionism-overadherence relationship that could help identify under what conditions perfectionists are at a greater risk for overadherence. Given the number of factors that likely impact rehabilitation overadherence behaviours (Wiese-Bjornstal et al., 1998), it would be beneficial to explore what conditions impact perfectionistic athletes' risk of overadherence. Some potential moderator variables, such as gender, sport type, and level of competition, were briefly assessed in the present study. Examining of these factors, and other potential moderators, in greater detail would help to paint a better picture of when perfectionists are at the greatest risk to overadhere.

Future research is also encouraged to examine potential mediators that could explain why perfectionism, and evaluative concerns in particular, seems to put injured athletes at a risk for overadherence. One such mediator might be athletic identity. Perfectionistic athletes are committed to their role as an athlete and perceive sport to be an important and meaningful domain in their lives (Hill, Witcher et al., 2015). Perfectionists also tend to demonstrate behaviours that are consistent with athletic norms and are beneficial for athletic success, including elevated levels of dedication, effort, and striving for high standards (Gotwals & Spencer-Cavaliere, 2014; Hill, Wicher et al., 2015). This strong identification with the athletic

role might be a particular problem among athletes with high levels of evaluative concerns, since their self-worth is dependent on sport performance (Gotwals & Spencer-Cavaliere, 2014), putting these athletes at a greater risk to overadhere (Hilliard et al., 2016; Podlog et al., 2013).

Conclusion

The current study was the first to establish a relationship between perfectionism and risk factors of rehabilitation overadherence among injured athletes. Perfectionism demonstrated theoretically-expected relationships with Inclinations to Overadhere and Normalization of Pain. This finding indicates that perfectionism is associated with injured athletes' inclinations to exceed exercises prescribed by their rehabilitation practitioner and re-engage in sport earlier than recommended, as well as tendencies to normalize pain during injury rehabilitation by accepting it and pushing through it. The results emphasized the negative role of evaluative concerns perfectionism in predicting risk factors of rehabilitation overadherence. On the other hand, personal standards perfectionism played a less significant role, but demonstrated evidence that having high personal standards in sport potentially provides a protective effect from the negative influence of evaluative concerns. On the other hand, perfectionism did not present theoretically-expected relationships with Expedited Rehabilitation and Effortful Healing. This suggests that sport injury rehabilitation presents a complex environment for perfectionists, full of conflicting emotions (Flett & Hewitt, 2014). Furthermore, sport injury rehabilitation overadherence is a complex behaviour that can be influenced by a number of different factors (Granquist et al., 2014; Niven, 2007). Research on rehabilitation overadherence is in its early stages and future research is needed to further examine the complex role of perfectionism, as well as other variables, in predicting this potentially harmful behaviour.

References

Arvinen-Barrow, M., Clement, Hamson-Utley, J. J., Kamphoff, C., Zakrajsek, R., Lee, S., … Martin, S. B.

(2016). Athletes' expectations about sport injury rehabilitation: A cross-cultural study. *Journal of*

Sport Rehabilitation, 25, 338-347. doi: 10.1123/jsr.2015-0018

Arvinen-Barrow, M., & Hemmings, B. (2013). Goal setting in sport injury rehabilitation. In M. Arvinen-

Barrow, & N. Walker (Eds.), *The psychology of sport injury and rehabilitation* (pp. 56-70). London:

Routledge.

Bassett, S. F., & Prapavessis, H. (2007). Home-based physical therapy intervention with adherence-

enhancing strategies versus clinic-based management for patients with ankle sprains. *Physical*

Therapy, 87, 1132-1143. doi: https://doi.org/10.2522/ptj.20060260

Bianco, T. (2001). Social support and recovery from sport injury: Elite skiers share their experiences.

Research Quarterly for Exercise and Sport, 72, 376-388. doi: 10.1080/02701367.2001.10608974

Biddle, S. J. H., Wang, C. K. J., Chatzisarantis, N. L. D., & Spray, C. M. (2003). Motivation for physical

activity in young people: Entity and incremental beliefs about athletic ability. *Journal of Sports*

Sciences, 21, 773-989. doi: 10.1080/02640410310001641377

Brewer, B. W. (1998). Adherence to sport injury rehabilitation programs. *Journal of Applied Sport*

Psychology, 10, 70-82. doi: 10.1080/10413209808406378

Brewer, B. W. (2010). The role of psychological factors in sport injury rehabilitation outcomes,

International Review of Sport and Exercise Psychology, 3, 40-61. doi: 10.1080/17509840903301207

Brewer, B. W., Van Raalte, J. L., Linder, D. E., & Van Raalte, N. S. (1991). Peak performance and the perils

of retrospective introspection. *Journal of Sport and Exercise Psychology, 13,* 227-238.

Clement, D., & Shannon, V. R. (2011). Injured athletes' perceptions about social support. *Journal of Sport*

Rehabilitation, 20, 457-470. doi: 10.1123/jsr.20.4.457

Costa, S., Coppolino, P., & Oliva, P. (2016). Exercise dependence and maladaptive perfectionism: The mediating role of basic psychological needs. *International Journal of Mental Health and Addiction, 14,* 241-256. doi: 10.1007/s11469-015-9586-6

Crocker, P. R. E., Gaudreau, P., Mosewich, A. D., & Kljajic, K. (2014). Perfectionism and the stress process in intercollegiate athletes: Examining the 2 × 2 model of perfectionism in sport competition. *International Journal of Sport Psychology, 45*, 61-84. doi: 10.7352/IJSP 2014.

Curry, T. (1993). A little pain never hurt anyone: Athletic career socialization and the normalization of sports injury. *Symbolic Interactions, 16,* 273-290. doi: 10.1525/si.1993.16.3.273

Dunn, J. G. H., Causgrove Dunn, J., Gotwals, J. K., Vallance, J. K. H., Craft, J. M., & Syrotuik, D. G. (2006). Establishing construct validity evidence for the Sport Multidimensional Perfectionism Scale. *Psychology of Sport and Exercise, 7,* 57–79. doi: 10.1016/j.psychsport.2010.04.013

Petrie, T. A., & Falkstein, D. L. (1998). Methodological, measurement, and statistical issues in research on sport injury prediction. *Journal of Applied Sport Psychology, 10,* 26-45.

Frey, J. H. (1991). Social risk and the meaning of sport. *Sociology of Sport Journal, 8*, 136-145. doi: 10.1123/ssj.8.2.136

Flett, G. L., & Hewitt, P. L. (2002). Perfectionism and maladjustment: An overview of theoretical, definitional, and treatment issues. In P. L., Hewitt & G. L. Flett (Eds.) *Perfectionism* (pp. 5-31). Washington, DC: American Psychological Association. doi: http://dx.doi.org/10.1037/10458-001

Flett, G. L., & Hewitt, P. L. (2005). The perils of perfectionism in sports and exercise. *Current Directions in Psychological Science, 14,* 14-18. doi: 10.1111/j.0963-7214.2005.00326.x

Flett, G. L., & Hewitt, P. L. (2014). "The perils of perfectionism in sport" revisited: Toward a broader understanding of the pressure to be perfect and its impact on athletes and dancers. *International Journal of Sport Psychology, 45,* 395-407. doi: 10.7352/IJSP 2014.45.395

Flett, G. L. & Hewitt, P. L. (2016). Reflections on perfectionism and the pressure to be perfect in athletes, dancers, and exercisers. In A. P. Hill (Ed.), *The psychology of perfectionism in sport, dance, and exercise.* (pp. 296-319). New York, NY: Routledge.

Gaudreau, P. (2012). A methodological note on the interactive and main effects of dualistic personality dimensions: An example using the 2 × 2 model of perfectionism. *Personality and Individual Differences, 52*, 26-31. doi: 10.1016/j.paid.2011.08.022

Gaudreau, P. (2016). The 2 × 2 model of perfectionism in sport, dance, and exercise. In A. P. Hill (Ed.), *The psychology of perfectionism in sport, dance and exercise* (pp. 174-200). New York: Routledge.

Gaudreau, P., & Antl, S. (2008). Athletes' broad dimensions of dispositional perfectionism: Examining changes in life satisfaction and the mediating role of sport-related motivation and coping. *Journal of Sport and Exercise Psychology, 30,* 356-382. doi: 10.1123/jsep.30.3.356

Gaudreau, P., Franche, V., Kljajic, K., & Martinelli, G. (2017). The 2 × 2 model of perfectionism: Assumptions, trends, and potential developments. In J. Stoeber (Ed.) *The psychology of perfectionism: Theory, research, applications.* New York: Routledge.

Gaudreau, P., & Thompson, A. (2010). Testing a 2 × 2 model of dispositional perfectionism. *Personality and Individual Differences, 48*, 532-537. doi: 10.1016/j.paid.2009.11.031

Gilbourne, D., & Taylor, A. H. (1998). From theory to practice: The integration of goal perspective theory and life development approach within an injury-specific goal-setting program. *Journal of Applied Health Psychology, 10*, 124-139. doi: 10.1080/10413209808406381

Gotwals, J. K. (2016). The tripartite model of perfectionism. In A. P. Hill (Ed.), *The psychology of perfectionism in sport, dance and exercise* (pp. 150-173). New York: Routledge.

Gotwals, J. K., & Dunn, J. G. H. (2009). A multi-method multi-analytic approach to establishing internal construct validity evidence: The Sport Multidimensional Perfectionism Scale 2. *Measurement in Physical Education and Exercise Science, 13*, 71-92. doi: 10.1080/10913670902812663

Gotwals, J. K., Dunn, J. G. H., Causgrove Dunn, J., & Gamache, V. (2011). Establishing validity evidence

    for the Sports Multidimensional Perfectionism Scale-2 in intercollegiate sport. *Psychology of Sport*

    and Exercise, 11, 423–432. doi: 10.1016/j.psychsport.2010.04.013

Gotwals, J., & Spencer-Cavaliere, N. (2014). Intercollegiate perfectionistic athletes' perspectives on

    achievement: Contributions to the understanding and assessment of perfectionism in sport.

    International Journal of Sport Psychology, 45, 271-297. doi: 10.7352/IJSP 2014.45.271

Gould, D., Dieffenbach, K., & Moffett, A. (2002). Psychological characteristics and their development in

    Olympic champions. *Journal of Applied Sport Psychology, 14,* 172-204. doi:

    10.1080/10413200290103482

Granquist, M. D., Podlog, L., Engel, J. R., & Newland, A. (2014). Certified athletic trainers' perspectives on

    rehabilitation adherence in collegiate athletic training settings. *Journal of Sport Rehabilitation, 23,*

    123-133. doi: 0.1123/jsr.2013-0009

Hagan, A. L., & Hausenblas, H. A. (2003). The relationship between exercise dependence symptoms and

    perfectionism. *American Journal of Health Studies, 18,* 133-137.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis.* Upper Saddle

    River, New Jersey: Pearson Education.

Hamachek, D. E. (1978). Psychodynamics of normal and neurotic perfectionism. *Psychology, 15,* 27-33.

Hamidi, S., & Besharat, M. A. (2010). Perfectionism and competitive anxiety in athletes. *Procedia Social*

    and Behavioral Sciences, 5, 813-817. doi: 10.1016/j.sbspro.2010.07.190

Hausenblas, H. A., & Symons Downs, D. (2002). Exercise dependence: A systematic review. *Psychology of*

    Sport and Exercise, 3, 89-123. doi: 10.1016/S1469-0292(00)00015-7

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis.* New York,

    NY: The Guilford Press.

Hayes, A. F., & Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behaviour Research Methods, 39*, 709-722.

Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology, 60*, 456-470.

Hewitt, P. L., Flett, G. L., Sherry, S. B., Habke, M., Parkin, M., Lam, R. W., … Stein, M. B. (2003). The interpersonal expression of perfection: Perfectionistic self-presentation and psychological distress. *Journal of personality and social psychology, 84,* 1303-1325. doi: 10.1037/0022-3514.84.6.1303

Hill, A. P. (2016). Conceptualizing perfectionism: An overview and unresolved issues. In A. P. Hill (Ed.), *The psychology of perfectionism in sport, dance and exercise* (pp. 3-30). New York: Routledge.

Hill, A. P., Hall. H. K., & Appleton, P. R. (2010). Perfectionism and athlete burnout in junior elite athletes: The mediating role of coping tendencies. *Anxiety, Stress, & Coping, 23,* 415-430. doi: 10.1080/10615800903330966

Hill, T., & Lewicki, P. (2007). *STATISTICS: Methods and applications.* Tulsa, OK: StatSoft.

Hill, A. P., Robson, S. J., & Stamp, G. M. (2015). The predictive ability of perfectionistic traits and self-presentational styles in relation to exercise dependence. *Personality and Individual Differences, 86,* 176-183. doi: 10.1016/j.paid.2015.06.015

Hill, A. P., Witcher, C. S. G., Gotwals, J. K., & Leyland, A. F. (2015). A qualitative study of perfectionism among self-identified perfectionists in sport and the performing arts. *Sport, Exercise, and Performance Psychology, 4,* 237-253. doi: 10.1037/spy0000041

Hilliard, R. C., Blom, L., Hankemeier, D., & Bolin, J. (2016). Exploring the relationship between athletic identity and beliefs about rehabilitation overadherence in collegiate athletes. *Journal of Sport Rehabilitation,* 1-39. doi: 10.1123/jsr.2015-0134

Kang, H. (2013). The prevention and handling of the missing data. *Korean Journal of Anesthesiology, 64*, 402-406. doi: 10.4097/kjae.2013.64.5.402

Levy, A. R., Polman, R. C. J., & Clough, P. J. (2008). Adherence to sport injury rehabilitation programs: An integrated psycho-social approach. *Scandinavian Journal of Medicine & Science in Sports, 18*, 798-809. doi: 10.1111/j.1600-0838.2007.00704.x

Loewenthal, K. M. (2001). In K. M. Loewenthal (Ed.), *An Introduction to Psychological Tests and Scales* (2nd ed., pp. 53-67) Philadelphia, PA: Taylor and Francis Group.

Lundh, L. (2004). Perfectionism and acceptance. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 22*, 255-269. doi: 10.1023/B:JORE.0000047311.12864.27

Madigan, D. J., Hill, A.P., Anstiss, P.A., Mallinson-Howard, S.H., & Kumar, S. (in press). Perfectionism and training distress in junior athletes: The mediating role of coping tendencies. *European Journal of Sport Science.*

Madigan, D. J., Stoeber, J., Forsdyke, D., Dayson, M., & Passfield, L. (2017). Perfectionism predicts injury in junior athletes: Preliminary evidence from a prospective study. *Journal of Sports Sciences.* doi: 10.1080/02640414.2017.1322709

Madigan, D. J., Stoeber, J., & Passfield, L. (2017). Perfectionism and training distress in junior athletes: A longitudinal investigation. *Journal of Sports Sciences, 35*, 470-475, doi: 10.1080/02640414.2016.1172726

Mallinson-Howard, S. H, Knight, C. J., Hill, A. P., & Hall, H. K. (2018). The 2 × 2 model of perfectionism and youth sport participation: A mixed-methods approach. *Psychology of Sport and Exercise, 36*, 162-173. doi: 10.1016/j.psychsport.2018.02.011

Meeusen, R., Duclos, M., Foster, M., Fry, A., Gleeson, M., Nieman, D., ..., & Urhausen, A. (2013). Prevention, diagnosis and treatment of the overtraining syndrome: Joint consensus statement of the

European College of Sport Science (ECSS) and the American College of Sports Medicine (ACSM). *European Journal of Sport Science, 13*, 1-24. doi: 10.1080/17461391.2012.730061

Meyers, M. C., Bourgeois, A. E., Stewart, S., & LeUnes, A. (1992). Predicting pain response in athletes: Development and assessment of the Sports Inventory for Pain. *Journal of Sport & Exercise Psychology, 14*, 249-261. doi: 10.1123/jsep.14.3.249

Mosewich, A. D., Crocker, P. R. E., & Kowalski, K. C. (2013). Managing injury and other setbacks in sport: Experiences of (and resources for) high-performance women athletes. *Qualitative Research in Sport, Exercise and Health, 6*, 182-204. doi:10.1080/2159676X.2013.766810

Nicholls, A. R. (2010). Effective versus ineffective coping in sport. In A. R. Nicholls (Ed.), *Coping in sport: Theory, methods and related constructs* (pp. 263-276). New York: Nova Science Publishers.

Niven, A. (2007). Rehabilitation adherence in sport injury: Sport physiotherapists' perceptions. *Journal of Sport Rehabilitation, 16*, 93-110. doi: 10.1123/jsr.16.2.93

Nunnally, J. C. (1978). *Psychometric theory.* 2nd ed. New York: McGraw-Hill.

Oxford Dictionary. (2017). *Oxford dictionary online dictionary.* Retrieved from https://en.oxforddictionaries.com/

Podlog, L., Dimmock, J., & Miller, J. (2011). A review of return to sport concerns following injury rehabilitation: Practitioner strategies for enhancing recovery outcomes. *Physical Therapy in Sport, 12*, 36-42. doi: 10.1016/j.ptsp.2010.07.005

Podlog, L., & Eklund, R. C. (2005). Return to sport after serious injury: A retrospective examination of motivation and psychological outcomes. *Journal of Sport Rehabilitation, 14*, 20-34. doi: 10.1123/jsr.14.1.20

Podlog, L. W., & Eklund, R. (2006). A longitudinal investigation of competitive athletes' return to sport following serious injury. *Journal of Applied Sport Psychology, 18*, 44-68. doi: 10.1080/10413200500471319

Podlog, L., & Eklund, R. C. (2007). The psychosocial aspects of a return to sport following serious injury: A review of the literature from a self-determination perspective. *Psychology of Sport and Exercise, 8,* 535-566. doi: 10.1016/j.psychsport.2006.07.008

Podlog, L., Gao, Z., Kenow, L., Kleinert, J., Granquist, M., Newton, M., & Hannon, J. (2013). Injury rehabilitation overadherence: Preliminary scale validation and relationships with athletic identity and self-presentational concerns. *Journal of Athletic Training, 48,* 372-381. doi: 10.4085/1062-6050-48.2.20

Podlog, L., Heil, J., & Shulte, S. (2014). Psychosocial factors in sports injury rehabilitation and return to play. *Physical Medicine and Rehabilitation Clinics of North America, 25,* 915-930. doi: 10.1016/j.pmr.2014.06.011

Raglin, J. S., & Morgan, W. P. (1994). Development of a scale for use in monitoring training-induced distress in athletes. *International Journal of Sports Medicine, 15,* 84-88.

Rees, T., Mitchell, I., Evans, L., & Hardy, L. (2010). Stressors, social support and psychological responses to sport injury in high- and low-performance standard participants. *Psychology of Sport and Exercise, 11,* 505-512. doi: 10.1016/j.psychsport.2010.07.002

Ruddock-Hudson, O'Halloran, & Murphy (2014). The psychological impact of long-term injury on Australian Football League players. *Journal of Applied Sport Psychology, 26,* 377-394. doi: 10.1080/10413200.2014.897269

Sellars, P. A., Evans, L., & Thomas, O. (2016). The effects of perfectionism in elite sport: Experiences of unhealthy perfectionists. *The Sport Psychologist, 30,* 219-230. doi: 10.1123/tsp.2014-0072

Stoeber, J. (2011). The dual nature of perfectionism in sports: Relationships with emotion, motivation, and performance. *International Review of Sport and Exercise Psychology, 4,* 128-145. doi: 10.1080/1750984X.2011.604789

Stoeber, J. (2012). The 2 × 2 model of perfectionism: A critical comment and some suggestions. *Personality and Individual Differences, 53,* 541-545. doi: 10.1016/j.paid.2012.04.029

Stoeber, J., & Madigan, D. J. (2016). Measuring perfectionism in sport, dance, and exercise. In A. P. Hill (Ed.), *The psychology of perfectionism in sport, dance, and exercise.* (pp. 31-56). New York, NY: Routledge.

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. *Personality and Social Psychology Review, 10,* 295-319. doi: 10.1207/s15327957pspr1004_2

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics.* Boston: Pearson Education.

Wiese-Bjornstal, D. M., Smith, A. M., Shaffer, S. M., & Morrey, M. A. (1998). An integrated model of response to sport injury: Psychological and sociological dynamics. *Journal of Applied Sport Psychology, 10,* 46-69.

Appendix A

Demographics Questionnaire

Demographics Questionnaire

ID:____

Please tell us a bit about your personal characteristics.

1. Please indicate the gender that you identify with.	____ Female	____ Male	____ Transgender	____ Gender Nonconforming
2. Please indicate your age.	____ (years)			

Please tell us a bit about your involvement in sport.

4. What sport(s) were you regularly training for, competing in, and/or participating in at the time of your injury?	Sport 1: _____ Sport 3: _____ Sport 2: _____ Sport 4: _____

Answer the following 4 questions based on the sports you identified above.

5. How long have you been taking part in your sport(s)?	Sport 1: ____ year(s) Sport 3: ____ year(s) Sport 2: ____ year(s) Sport 4: ____ year(s)

6. Please indicate the highest level at which you currently compete for your sport(s).

Sport 1:	____ Local ____ National ____ Regional ____ International	Sport 3:	____ Local ____ National ____ Regional ____ International
Sport 2:	____ Local ____ National ____ Regional ____ International	Sport 4:	____ Local ____ National ____ Regional ____ International

7. At the time of your injury, how many days a week were you training for, competing in, and/or participating in your sport(s)?	Sport 1: ____ day(s)/week Sport 3: ____ day(s)/week Sport 2: ____ day(s)/week Sport 4: ____ day(s)/week

Order # _____

Please tell us a bit about your current injury.

8. What is the primary injury that you are you currently rehabilitating?	_____
9. How did this injury develop?	_____ Suddenly _____ Gradually over a period of time

10. To what extent does your injury restrict your ability to participate in your sport(s)? *Please circle your response for each sport that you play.*

	Able to Participate with Slight Restrictions		Able to Participate with Moderate Restrictions		Completely Restricted From Participation
Sport 1:	1	2	3	4	5
Sport 2:	1	2	3	4	5
Sport 3:	1	2	3	4	5
Sport 4:	1	2	3	4	5

11. Approximately when did your current injury occur? Or when did you notice that it had begun to restrict your ability to perform your sport(s)?	_____ mm/dd/yyyy
12. Will surgery be required for your current injury? Or have you already had surgery for your current injury?	_____ Yes _____ No

Please tell us a bit about your current rehabilitation experience.

---

13. Think of the rehabilitation practitioner who plays the biggest role in the rehabilitation of your injury. What is this practitioner's profession?

_____ Physiotherapist   _____ Athletic Therapist   _____ Massage Therapist

_____ Kinesiologist   _____ Chiropractor

_____ Other (specify)

---

14. Approximately when did you first meet with this rehabilitation practitioner to start rehabilitating your injury?	_____ mm/dd/yyyy
15. Approximately how many appointments have you had with this practitioner to rehabilitate your current injury?	_____ appointments

---

16. What kind of home exercises have you been prescribed for your injury? *Please check all that apply.*

_____ Stretching exercises   _____ Balance exercises   _____ Applying heat/ice to the area

_____ Strengthening exercises   _____ Cardio conditioning exercises

---

17. In your opinion, what point are you at in the rehabilitation of your injury? *Please circle your response.*

Just beginning		*Halfway through*		*Nearing the end*
1	2	3	4	5

General Instructions (Please Read Carefully)

★ You will now be asked to complete four questionnaires relating to your feelings, attitudes, and expectations toward your sport and your coaches.

★ Please read all instructions carefully before completing the questionnaire.

★ There are **no right or wrong answers,** so do not spend too much time on any one question, and answer as honestly as you can.

★ Some of the questions may appear to be very similar. Please ignore this and respond to each item accurately.

★ *The individual information you provide here will be kept private. No one, other than the research team, will ever see your individual responses to these questionnaires.*

Appendix B

Sport Injury Rehabilitation Overadherence Scale

Rehabilitation Behaviours and Beliefs

INSTRUCTIONS The purpose of this questionnaire is to identify how injured athletes think and act during their rehabilitation. Below are some sentences that describe your general beliefs and tendencies towards sport injury rehabilitation adherence. Please indicate to what extent each phrase is true for you, according to your experiences while rehabilitating your current injury. (Circle one response option to the right of each statement). There are no right or wrong answers so please don't spend too much time on any one statement; simply choose the answer that best describes how you view each statement.

To what extent do you agree or disagree with the following statements?	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1. In rehabilitation, the harder I work hard at it, the faster my injury will heal.	1	2	3	4	5
2. When I experience pain in rehabilitation, I believe I owe it myself and others to push through it.	1	2	3	4	5
3. I have a desire to do my rehabilitation activities more often than my practitioner prescribed.	1	2	3	4	5
4. I tend to intensify the rehabilitation exercises recommended by my practitioner.	1	2	3	4	5
5. When my injury rehabilitation becomes painful, I tell myself to be tough and carry on.	1	2	3	4	5
6. If I put enough effort into rehabilitation, my injury will always get better.	1	2	3	4	5
7. I'm apt to exceed my practitioner's guidelines regarding the rehabilitation of my injury.	1	2	3	4	5
8. The faster I can rehabilitate my injury, I faster I can get back to my sport—that's important to me.	1	2	3	4	5
9. When rehabilitating my injury gets painful, I just go on as if nothing happened	1	2	3	4	5
10. No matter how bad the pain gets as I rehabilitate my injury, I can handle it.	1	2	3	4	5
11. I'm apt to return to my sport, or to play my sport at full speed, earlier than recommended by my practitioner.	1	2	3	4	5
12. My injury will always improve if I work at my rehabilitation.	1	2	3	4	5
13. When I return to sport, I'm apt to play or train at a higher intensity than recommended by my practitioner.	1	2	3	4	5

14.	I want to rehabilitate my injury quickly so that I can speed up my return to sport.	1	2	3	4	5
15.	I'm inclined to overdo the rehabilitation activities prescribed by my practitioner.	1	2	3	4	5
16.	I am eager to rehabilitate my injury quickly because that means that I can get back to my sport sooner.	1	2	3	4	5
17.	When I return to my sport, I have (or will have) trouble adhering to my practitioner's recommendations to hold back my effort.	1	2	3	4	5
18.	I see the pain associated with the rehabilitation of my injury as a challenge, and it doesn't bother me.	1	2	3	4	5
19.	I want to get through my injury rehabilitation as fast as I can so that I can return to my sport as soon as possible.	1	2	3	4	5
20.	Pain is just a part of rehabilitation.	1	2	3	4	5
21.	Speeding up the rehabilitation of my injury is important because it cuts down on the time that I am away from my sport.	1	2	3	4	5
22.	When rehabilitating my injury hurts, I do not let the pain stand in the way.	1	2	3	4	5
23.	Despite my practitioner's suggestions, I'm inclined to do "too much, too soon" when returning to sport.	1	2	3	4	5

Appendix C

Sport-Multidimensional Perfectionism Scale-2 and the Multidimensional Inventory of Perfectionism

in Sport

Sport Motivation

INSTRUCTIONS The purpose of this questionnaire is to identify how athletes view certain aspects of their competitive experiences in sport. Please help us to more fully understand how athletes view a variety of their competitive experiences by indicating the extent to which you **agree or disagree** with the following statements. (Circle one response option to the right of each statement). These questions relate to your sport experiences in the sport that you are currently restricted from participating in, as a result of your injury. **There are no right or wrong answers** so please don't spend too much time on any one statement; simply choose the answer that best describes how you view each statement.

	To what extent do you agree or disagree with the following statements?	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1.	It is important to me that I be thoroughly competent in everything I do in my sport.	1	2	3	4	5
2.	If a team-mate or opponent performs better than me during competition, then I feel like I failed to some degree.	1	2	3	4	5
3.	I set plans that highlight the strategies I want to use when I compete.	1	2	3	4	5
4.	During competitions, if something does not go perfectly, I am dissatisfied.	1	2	3	4	5
5.	During competitions, I am a perfectionist as far as my targets are concerned.	1	2	3	4	5
6.	During competitions, I get completely furious if I make mistakes.	1	2	3	4	5
7.	If I fail in competition, I feel like a failure as a person.	1	2	3	4	5
8.	If I do not do well all the time in competition, I feel that people will not respect me as an athlete.	1	2	3	4	5
9.	I develop plans that dictate how I want to perform during competition.	1	2	3	4	5
10.	During competitions, I feel the need to be perfect.	1	2	3	4	5
11.	The fewer mistakes I make in competition, the more people will like me.	1	2	3	4	5
12.	During competitions, I get frustrated if I do not fulfill my high expectations.	1	2	3	4	5
13.	I hate being less than the best at things in my sport.	1	2	3	4	5

14.	I think I expect higher performance and greater results in my daily sport-training than most athletes.	1	2	3	4	5
15.	I rarely feel that my training fully prepares me for competition.	1	2	3	4	5
16.	During competitions, I feel depressed if I have not been perfect.	1	2	3	4	5
17.	On the day of competition I have a routine that I try to follow.	1	2	3	4	5
18.	I usually feel unsure about the adequacy of my pre-competition practices.	1	2	3	4	5
19.	If I perform well but only make one obvious mistake in the entire competition, I still I still feel disappointed with my performance.	1	2	3	4	5
20.	I set higher achievement goals than most athletes who compete at my sport.	1	2	3	4	5
21.	Even if I fail slightly in competition, for me, it is as bad as being a complete failure.	1	2	3	4	5
22.	During competitions, I strive to be as perfect as possible.	1	2	3	4	5
23.	People will probably think less of me if I make mistakes in competition.	1	2	3	4	5
24.	I follow a routine to get myself into a good mindset going into competition.	1	2	3	4	5
25.	I have and follow a pre-competitive routine.	1	2	3	4	5
26.	During competitions, I feel extremely stressed if everything does not go perfectly.	1	2	3	4	5
27.	I follow pre-planned steps to prepare myself for competition.	1	2	3	4	5
28.	I usually feel uncertain as to whether or not my training effectively prepares me for competition.	1	2	3	4	5
29.	During competitions, it is important to me to be perfect in everything I attempt.	1	2	3	4	5
30.	I should be upset if I make a mistake in competition.	1	2	3	4	5

31.	During competitions, I have the wish to do everything perfectly.	1	2	3	4	5
32.	If I do not set the highest standards for myself in my sport, I am likely to end up a second-rate athlete.	1	2	3	4	5
33.	Prior to competition, I rarely feel satisfied with my training.	1	2	3	4	5
34.	I usually have trouble deciding when I have practiced enough heading into a competition.	1	2	3	4	5
35.	I feel that other athletes generally accept lower standards for themselves in sport than I do.	1	2	3	4	5
36.	I rarely feel that I have trained enough in preparation for a competition.	1	2	3	4	5
37.	I have extremely high goals for myself in my sport.	1	2	3	4	5

Appendix D

Gatekeeper Information Letter

ON LAKEHEAD LETTERHEAD

Dear [Gatekeeper Name],

My name is Kristi MacWilliam. I am a student in the Master of Science in Kinesiology program at Lakehead University. I am conducting a research study titled, *"Perfectionism and Rehabilitation Overadherence Among Injured Athletes",* under the supervision of Dr. John Gotwals. The purpose of this letter is to describe this study and to ask if you would be willing to collaborate with us in the identification of potential participants.

This project is focused on exploring the role of perfectionism – a personality trait that is likely common among injured athletes – and injured athletes beliefs and tendencies related to rehabilitation overadherence – or overdoing recommended injury rehabilitation protocols. This is important because overadherence is likely a harmful behaviour that could lead to re-injury, rehabilitation setbacks, and a prolonged recovery time and return to sport. Such research may be of interest to any individuals who work with injured athletes. For example, this could allow healthcare professionals to identify individuals who are at a higher risk for overadherence and hopefully promote proper adherence behaviours, and as a result, better overall rehabilitation outcomes. Furthermore, this might help sport administrators, coaches, trainers, and team captains to better support injured athletes in their return to full sport participation after injury by making them more aware of injured athletes' possible tendencies to overdo rehabilitation.

We are looking to recruit individuals who are injured athletes over the age of 16 years, currently undergoing rehabilitation for their injury, and are restricted in their ability to participate in sport as a result of their injury. We would greatly appreciate it if you could foster our ability to recruit individuals that meet these inclusion criteria and that may be interested in participating. This could involve mentioning the study to such individuals, distributing information letters about the study (which we will provide) to them, and/or fostering our ability to contact them. We would then take over the process of officially informing the individuals about the study and formally asking them if they wanted to take part in the study. Doing so would involve the completion of four questionnaires and take approximately 30 minutes of their time.

Take note that you will not be allowed to be in the immediate vicinity while the athletes are informed about the study and complete the questionnaires. We will also not be able to tell you if any specific individual decided to participate in the study or provide you with results based on data from any specific individual. However, we would gladly provide you with a summary of the general results of the study, discuss those results with you, and work with you to develop strategies designed to foster proper rehabilitation adherence among injured athletes.

We will be contacting you soon to clarify any questions you may have about our study. Please feel free to contact us as well. The study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca

We hope that you find this study interesting and will help us to recruit potential participants. Please **respond to krmacwil@lakeheadu.ca indicating your willingness to do so.**

Thank you for your consideration,

Ms. Kristi MacWilliam   Dr. John Gotwals
MSc. Kinesology Candidate   Associate Professor
Graduate Student Researcher   Faculty Supervisor
(807) 407-5726   (807) 346-7952
krmacwil@lakeheadu.ca   john.gotwals@lakeheadu.ca

Appendix E

Participant Information Letter

ON LAKEHEAD LETTERHEAD

Dear Potential Participant,

We invite you to participate in a research project titled, *"Perfectionism and Rehabilitation Overadherence in Injured Athletes"*. This project is being run by a team of researchers. Ms. Kristi MacWilliam is carrying out the project; it represents the thesis that she is completing as a student in the Master of Science program offered out of the School of Kinesiology at Lakehead University. Dr. John Gotwals serves as Kristi's primary supervisor and Dr. Paolo Sanzo and Mrs. Leanne Smith serve on Kristi's thesis committee.

Your participation in the project is being requested, as you are an injured athlete over the age of 16 currently undergoing sport injury rehabilitation, who is restricted in your ability to participate in sport as a result of that injury. The purpose of this letter is to describe the study so you can make an informed decision about whether to participate.

Your Role in the Project
Your participation in this project would involve the completion of four questionnaires. Below is a summary of the procedure:

    (1)   At a meeting time that is convenient for you, you would complete a brief packet of surveys. The first survey is a basic demographic information questionnaire that asks for general information about yourself, your background in sport, your injury, and the rehabilitation of that injury. A second survey asks you about beliefs and attitudes that athletes may have towards the rehabilitation of their injury. A third survey present questions associated with being perfectionistic towards sport. A fourth survey asks questions related to how you view yourself as an athlete.

    (2)   The questionnaire packet will take about 30 minutes for you to complete.

Ethical Issues Regarding Your Participation

    (1)   Your decisions to take part in the study will be entirely voluntary. Your decision to take part will have no impact upon your experiences in the rehabilitation of your injury or your participation in sport.

    (2)   We are taking steps to support the confidentiality and anonymity of your responses. Individuals associated with your injury rehabilitation (e.g., physiotherapists, athletic therapists), sport participation (e.g., team coach, teammates), or personal life (e.g., parent, significant other) will be asked to leave the room during survey completion. These individuals also will not have access to any of your personal data. If you decide to participate, a unique id number will be assigned to you and that id number (as opposed to your name) will be associated with your responses in all analyses. Finally, if we choose to publish or present a public presentation of the results from this study, your identity and your individual results will be kept anonymous.

    (3)   There are no mental or physical risks or benefits associated with completing the surveys.

(4)   You may decline to take part or drop out from any stage of the study for any reason with no consequences. You may also choose to not answer or skip any question on any of the questionnaires.

Data Access and Presentation

(1)   Hard copies of your completed questionnaires will be stored in a locked office at Lakehead University. Electronic files compiling your responses will be password protected and stored on research team members' computers. Only the research team will have access to these hard copies and electronic files.

(2)   All data will be kept in a locked file cabinet in the office of Dr. John Gotwals in the School of Kinesiology for a period of five years after the completion of the study.

(3)   A report of the study's findings can be provided to you. This report will be available by September 2018.

(4)   We will be happy to discuss any aspect of the study with you at any time.

If you have any questions or concerns at any point during this investigation, please do not hesitate to contact either the graduate student researcher or her faculty advisor. The study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca

Thank you for your consideration,

Ms. Kristi MacWilliam   Dr. John Gotwals
MSc. Kinesology Candidate   Associate Professor
Graduate Student Researcher   Faculty Supervisor
(807) 407-5726   (807) 346-7952
krmacwil@lakeheadu.ca   john.gotwals@lakeheadu.ca

Appendix F

Participant Consent Form

ON LAKEHEAD LETTERHEAD

PARTICIPANT CONSENT FORM

Title of Project: *Perfectionism and Rehabilitation Overadherence in Injured Athletes*

Principal Investigator: *Dr. John Gotwals, Lakehead University, (807) 346-7952, john.gotwals@lakeheadu.ca*

Student-Investigator: *Ms. Kristi MacWilliam, Lakehead University, (807) 407-5726, krmacwil@lakeheadu.ca*

To be completed by the research participant:

I have read and understand that:

- I have been asked to take part in the above mentioned research study;

- There are no mental or physical risks or benefits associated with participation in this study;

- I may contact the student researcher or her supervisor at any time throughout the study to ask questions regarding my participation;

- My participation is voluntary and I have the right to stop participation at any time, without consequence and that my information will be removed from the study at my request;

- The anonymity and confidentiality of my data will be maintained to the highest degree, only members of the research team will have access to my data;

- Any information presented in the academic community will maintain my anonymity and confidentiality;

- Information I provide will be securely stored for a minimum of 5 years in the School of Kinesiology at Lakehead University; and

- If I choose, I may provide my contact information, or I may contact the researcher by phone or e-mail, to obtain a summary of the findings from this study.

I agree to take part in this study:

_____   _____
Signature   Date

_____
Printed Name

☐ I would like to receive a summary of the results when completed.

_____   _____
Email   Phone Number