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Exploring the Relationship Between Stress-Related Growth and Basic Psychological Needs Following Athletic Injuries

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Exploring the Relationship Between Stress-Related Growth and Basic Psychological Needs Following Athletic Injuries

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Master's Thesis

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Exploring the Relationship Between Stress-Related Growth and Self-Determination Theory in Athletic Injuries

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In Partial Fulfillment
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by
Samantha MacDonald
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Abstract

Approximately 8.6 million sport-related injuries occur yearly in the United States that cause a variety of physical and psychological outcomes. One positive psychological consequence after injury is stress-related growth (SRG), which is positive change experienced after undergoing something stressful. The aim of the present study was to investigate how the full model of basic psychological needs was related to SRG and explore sources of need satisfaction while injured. SRG and basic psychological need satisfaction and frustration was measured in 93 competitive adult athletes who suffered lower limb sport injuries within the past 5 years. Multiple regression analyses did not result in statistically significant relationships between stress-related growth, need fulfillment or frustration, and injury severity, which mostly was contrary to previous findings. Further, the majority of participants reported that only the relatedness need was satisfied in sport and that personal relationships were the most common source of need satisfaction while injured.

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Table of Contents

List of Tables and Figures

List of Appendices

Literature Review

Introduction

When athletes experience a serious injury, both their mind and body can be negatively affected (Sheinbein, 2016). However, athletes may find that while their injury was unfortunate, they experienced some positive change, such as becoming better prepared for future adversities (Tedeschi & Calhoun, 2004). Positive change after experiencing trauma has been referred to as posttraumatic or stress-related growth (Tedeschi & Calhoun, 2004). Evidence indicates that an athlete can grow from injury; however, the question of how that growth occurs remains unanswered (Galli & Gonzalez, 2015). Stress-related growth might be influenced by the satisfaction of the three basic psychological needs outlined in the self-determination theory (Ryan & Deci, 2000). According to Ryan and Deci's (2000) theory of motivation, self-determination theory, people are more internally motivated when their basic psychological needs for autonomy, relatedness, and competence are fulfilled. It is possible to facilitate an environment where an athlete's needs are satisfied in order to promote the autonomous motivation that comes with having the three psychological needs fulfilled (Podlog, Wadey, Stark, Lochbaum, Hannon, & Newton, 2013). This literature review will include an overview of models that describe potential responses to injury, the negative psychological effects of athletic injury, and stress-related growth, as well as an explanation of how the self-determination theory and the fulfillment of the three basic psychological needs may affect stress-related growth post athletic injury, as a result of recovery and rehabilitation experiences.

Models of Coping/Threat Appraisal

When people are faced with stressful events or situations, there are many ways they may react. That reaction may be dependent upon the appraisal of the situation at hand (Lazarus &

Folkman, 1987). Lazarus and Folkman (1987) developed the transactional theory of emotions and coping, which proposes a process people go through when faced with a potentially stressful event or situation. They state that when faced with a situation, a person has a *primary appraisal* of the event, where they determine whether or not a threat is posed (Lazarus & Folkman, 1987). If a threat is perceived, *secondary appraisal* then occurs in that one must determine if they have the ability to cope or if they are unable to cope with the perceived threat. Finally, if people think they are able to cope, positive stress results. According to Lazarus and Folkman, *positive stress* is a positive emotional reaction that may result from a stressful situation. Conversely, if someone is unable to cope after a stressful event, *negative stress* occurs (Lazarus & Folkman, 1987). The transactional theory of coping explains general life stress and could be applied to sport injury; however, models have been developed specifically to explain psychological reactions after athletic injury.

The injury response model theorizes a similar process of appraisal as the transactional model; however, it is specific to athletic injury (Udry, 1997). This model builds on the transactional theory in that it adds that one's experience of positive or negative stress directly influences the behavioral and emotional consequences experienced in that situation. The model begins with the occurrence of an injury, followed by the athlete's appraisal of the injury; the appraisal process includes consideration of both the severity of the injury and the perceived control the athlete will have over the situation. The next three steps of the model are the emotional response, coping response, and behavioral response, with social support influencing both the athlete's appraisal and response to the injury occurrence (Udry, 1997). For example, if an athlete fractures his foot, his interpretation of the injury will affect his coping, emotional, and behavioral responses. In this case, the athlete's appraisal that his season may be over could result

in the athlete feeling depressed, isolating himself from his team, and engaging in irresponsible behavior in order to cope. The injury response model emphasizes the importance of the person's own appraisal of the situation and takes into account the amount of influence the individual's perception of the situation has on the emotional and behavioral reactions that follow (Lazarus & Folkman, 1987; Udry, 1997).

Individual differences in coping with injury. While there are athletes who have negative experiences due to injury, there may be a large portion of athletes who do not have extreme negative responses to injury (Wiese-Bjornstal, Smith, Shaffer, & Morrey, 1998). It appears that those who have positive mood state profiles prior to experiencing an injury typically do not have extreme mood disturbances as a result of injury (Wiese-Bjornstal et al., 1998). Additionally, experiencing negative emotions when injured does not have to equate to a negative injury response. Athletes can also be motivated by negative emotions to return to sport with urgency and be willing to endure the difficult rehabilitation in order to get back to play (Wiese-Bjornstal et al., 1998). Overall, the injury response model involves various factors that may influence an athlete's individual response to injury, each individual factor can make a notable difference in how someone responds to their injury.

The factors that individually influence the response to injury were additionally explored in injured athletes to determine which accounted the most for the different ways people cope. Shapiro, Brewer, Cornelius, and Van Raalte (2017) found that not everyone copes with injury in the same way. Shapiro and colleagues (2017) studied 73 athletes, ranging from 14 to 54 years old, who underwent ACL reconstruction and rehabilitation. The participants were surveyed before their surgery and then again one week and six weeks following the surgery. The authors found that not every athlete reacted the same post-injury. Some participants responded resiliently

while others responded negatively. One consistent finding was that those who responded negatively post-surgery had higher levels of neuroticism prior to having surgery (Shapiro et al., 2017). Perhaps those with high neuroticism appraised the situation to be more threatening than those who were not high in this particular personality trait. There appears to be other factors, such as appraisal and personality traits, that may explain why people respond to an injury the way that they do (Carson & Polman, 2008; Lattimore, 2017). Athletes' injury appraisal can have an effect on when they return to sport and when they consider themselves to be recovered, this can also have an impact on their future. If athletes return to sport too soon, whether they are physically or mentally not ready, they are more likely to reinjure themselves or have poor performances in their sport (Salim, Wadey, & Diss, 2015).

There is evidence that the individual appraisal of the injury may be important to the emotional reaction that follows (Udry, 1997). In a qualitative study of ten NCAA Division III athletes with moderate to severe injuries, Tracey (2003) concluded that the athlete's appraisal of the injury had more of an impact on increasing negative emotions than the occurrence of the injury itself. Regardless of what trainers, coaches, or doctors tell an athlete about their injury, athletes rely on their own perception about the severity of their injury, how much control they have over their recovery, and how the injury is going to affect them going forward (Carson & Polman, 2008).

In summary, there are several theories that attempt to explain why athletes respond differently to injury. Lazarus and Folkman's (1987) transactional theory of emotions and coping states that a person's primary and secondary appraisal of an event determines whether positive or negative stress will follow. The injury response model builds on the transactional theory of emotions and coping to make it specifically applicable to athletic injury (Udry, 1997). Udry's

(1997) model theorizes that after the athlete's appraisal of an injury, the appraisal determines what emotional response, coping response, and behavioral response will follow. These theories include the possibility that one's mood state may impact how they respond to injury (Wiese-Bjornstal et al., 1998), as well as one's level of neuroticism (Shapiro et al., 2017); regardless of personality traits, researchers have concluded that the athlete's own thoughts and perceptions of their injury, no matter what doctors or trainers think about the severity of the injury or what the injury may mean for the athlete's future, may account for the wide variety of responses to the experience of an injury in general (Tracey, 2003).

Psychological Effects of Injury

When the psychological aspect on an injury is not addressed in rehabilitation, athletes may face difficulties such as fear of reinjury, mental blocks in performance, and somatic effects such as muscle tension, all which may heighten the chance of reinjury (Sheinbein, 2016). Athletes who return to sport and are successful post-injury tend to spend their time while injured recovering both mentally and physically (Sheinbein, 2016). In addition to time spent in rehabilitation, other physical factors may influence an athlete's post-injury reaction. Severity of injury appears to have an impact on the reaction an athlete has to injury. Masten, Stražar, Žilavec, Tušak, and Kandare (2014) found that among 68 athletes with surgical knee injuries, the athletes with more severe injuries had more negative reactions to the injury and used more individual coping skills to manage pain. Severity of injury was also closely tied with athletes' time away from sport due to injury and the coping required to rehabilitate (Masten et al., 2014). The authors suggested that athletes with more severe injuries may use more pain-coping skills than non-severely injured athletes, because athletes with severe injuries are more involved and spend more time in the rehabilitation process. Those athletes with less severe injuries were,

perhaps, not allowed the time to fully adjust to their injury and learn to cope with the injury sufficiently (Masten et al., 2014). Additional research indicates that the visual appearance of the injury and comments from athletic trainers also influenced the negative emotions associated with the injury (Masten et al., 2014). Appearance of the injury can influence athletes' emotions because, if the injury is more gruesome, it is interpreted as more serious or harmful (Masten et al., 2014). If comments from athletic trainers are indicative of the injury being more serious, athletes appraises it as more of a threat, and therefore have a more negative emotional reaction (Masten et al., 2014).

Serious injuries can have a negative effect on someone, especially if the injury affects everyday life, as a lower-extremity injury may, or if it is an athlete who is highly competitive or invests a great amount of time in their sport (Brewer 2007; Christino, Fantry, & Vopat, 2015). The many factors identified in the injury response model can have an effect on whether or not someone experiences positive or negative psychological consequences (Brewer, 2012). Positive injury outcomes may involve growth and renewed perspective, while negative experiences often involve decreased confidence, increased anxiety, and sometimes symptoms of depression (Carson & Polman, 2008; Ford & Gordon, 1999; Hutchinson, Mainwaring, Comper, Richards, & Bisschop, 2009).

Negative psychological effects of injury. Injuries to the body not only have a negative impact physically, but may also negatively affect people psychologically. Sustaining an injury can be a traumatic experience, depending on how the injury was sustained (Green & Weinberg, 2001), and may cause increased psychological stress (Podlog, Dimmock, & Miller, 2011). Physical injuries are different from other experiences of trauma because they can require physical recovery in addition to psychological and emotional recovery (Hefferon, 2012).

Physical injuries may also be intrusive into everyday life because they can be physically debilitating (Ford & Gordon, 1999); depending on where the injury is sustained, it can have a large effect on life in general. For example, an injury to a lower extremity could make walking difficult and interfere with daily functioning. Injuries that occur as a result of sports often have to be rehabilitated in order to return to sport and enduring rehabilitation can be a stressful event on its own (Kvist, Ek, Sporrstedt, & Good, 2005; Podlog et al., 2011). Interestingly, Leddy, Lambert, and Ogles (1994) suggested that because medical technology has significantly decreased the time an athlete spends out of sport participation from injury, athletes are no longer allowed enough time to psychologically cope with their injury.

While injuries do require physical recovery and pose a threat to an athlete's physical abilities, injuries may also come with psychological threats to an athlete's mental health and well-being (Carson & Polman, 2008). Negative emotional effects may even be expected by an athlete following a serious athletic injury (Brewer, 2012; Ford & Gordon, 1999). Negative reactions after an athletic injury can include the presence of depressive symptoms, anxiety, reduced self-esteem, or loss of identity (Christino et al., 2015; Ford & Gordon, 1999; Green & Weinberg, 2001; Hutchinson et al., 2009; Kvist et al., 2005; Leddy et al., 1994; Podlog et al., 2011). Sport injury can be a large determinant in athletes' self-image, as it may cause them to change the way they view their body, potentially resulting in extreme anger and frustration (Leddy et al., 1994). Taking an athlete out of the sport they play regularly can also result in a loss of identity, isolation from teammates, and a decrease in fitness and skills in the particular sport (Green & Weinberg, 2001).

The potential for symptoms of depression after an athletic injury is evident in past research. For example, Hutchinson and colleagues (2009) compared the emotional reactions of

athletes suffering from a concussion (n = 20) to athletes with a musculoskeletal injury (n = 14) and a healthy control group (n = 19). The findings revealed that both injured groups of athletes experienced emotional disturbance and that injured athletes frequently experienced depression. The concussed athletes experienced increased fatigue and decreased vigor, while the athletes with the musculoskeletal injuries experienced increased anger (Hutchinson et al., 2009). Similar results were found in other concussed athletes (Roiger, Weidauer, & Kern; 2015). Depressive symptoms post injury may vary with the severity of the injury. In a study of competitive athletes, Smith and colleagues (1993) found that severity of injury was the most important factor predicting depression after injury. The authors found that the athletes who suffered more severe injuries were more likely to be more depressed once they were injured (Smith et al., 1993).

Social support can also influence one's injury experience. When people have social support during injury rehabilitation, their relationships with those people can be improved and the injured people feel that they have an increase in their number of resources; this reduces the stress an athlete feels as a result of the injury (Ford & Gordon, 1999). Alternatively, a lack of social support can make the experience of injury even worse. Feelings of being alone, abandoned, or isolated from sources of social support can intensify the perception of lost resources and make the injury experience appear even more negative and hopeless (Ford & Gordon, 1999). This negative experience may add to the common feelings of depression post injury (Ford & Gordon, 1999).

Another potential consequence of athletic injury closely related to depression is loss of identity. A person's athletic identity refers to how closely they connect with being an athlete and how much of their life is centered on their sport (Ford & Gordon, 1999; Green & Weinberg, 2001). Brewer (1993) found that athletes with higher athletic identity were more likely to have a

depressed mood after suffering a serious injury. This is likely due to the over-identification with the athlete role (Brewer, 1993); when a serious injury interferes with participation, or takes it away completely, the athlete may find it difficult to cope (Green & Weinberg, 2001). Long-term injury typically results in a change in roles on the team or in the hierarchy among team dynamics, which can result in changes in playing time or leadership (Ford & Gordon, 1999). When athletes are not only dealing with an injury but are also coping with the potential of losing their roles on teams, their identity is likely threatened (Ford & Gordon, 1999). In a study of both competitive and recreational athletes (ages 14 to 54) undergoing ACL surgery, Brewer and Cornelius (2010) found that the most significant decrease in athletic identity occurred between 6 and 12 months following the reconstructive surgery. The authors highlighted that this large decrease in identity occurred as the rehabilitative process slowed down and as the exercises became more intensive (Brewer & Cornelius, 2010).

Athletes who strongly identify with being an athlete often depend on sport for self-esteem (Brewer 1993; Green & Weinberg, 2001). Self-esteem has been negatively related to athletic injury, athletes with chronic injuries report having a lower self-esteem than athletes with acute injuries (Wasley & Lox, 1998). After suffering an injury, athletes may attempt to reduce or downplay the importance of their athletic identity in order to protect their ego. By reducing their connection to their athletic identity, athletes maybe trying to protect themselves from the possibility of failing or being disappointed if they are unable to return at the same level or at all (Christino et al., 2015). Athletes may try to disassociate from their athletic role in order to protect self-esteem; however, those who closely identify and rely on athletics for their identity may harm their self-esteem in the long run, as the injury or the dissociation with the athlete role may be perceived as failure (Christino et al., 2015).

Anxiety is another psychological effect commonly associated with athletic injury, particularly in regard to returning to sport (Covassin, Crutcher, Bleeker, Heiden, Dailey, & Yang, 2014; Podlog et al., 2011). After refraining from participation for a long period of time, there are many factors that may influence returning to sport (Covassin et al., 2014). One large contributor to this anxiety is fear of reinjury (Covassin et al., 2014; Podlog et al., 2011). Re-injury anxiety can potentially prevent athletes from ever returning to sport, can increase the possibility of reinjury, and can negatively affect post-injury performance (Podlog et al., 2011). Fear of suffering another injury often comes from feeling or appearing to be physically incapable as a result of the initial injury or out of shape due to being forced to take time off (Podlog & Ecklund, 2006).

Overall, suffering an injury can have many negative psychological effects. The way athletes are affected is dependent upon their appraisal of their injury and the coping mechanisms used to respond. For example, according to Lazarus and Folkman's (1987) model, if an athlete were to suffer an injury to their knee, the athlete would first appraise the injury to determine if it poses a threat to them. Once athletes decide if the injury is or is not a threat, they then decide if they have the coping mechanisms to overcome the threat, this conclusion may result in positive or negative stress (Lazarus & Folkman, 1987). The injury response model, developed by Udry (1997), builds on the appraisal response by determining the potential consequences of the positive or negative stress. If negative stress ensues from feeling threated without coping mechanisms, the emotional, coping, and behavioral responses are affected by that stress (Lazarus & Folkman, 1987; Udry, 1997). In this case, the athlete without coping mechanisms may experience symptoms of depression and anxiety, or even struggle with a loss of identity or self-esteem due to this injury that has been perceived as a threat (Covassin et al., 2014; Ford &

Gordon, 1999; Hutchinson et al., 2009; Udry, 1997; Wasley & Lox, 1998). While each person's experience is different and the effects are individual, potential negative effects of injury can be very serious including symptoms of depression, feelings of abandonment, loss of identity, a decrease in self-esteem, and anxiety (Christino et al., 2015; Ford & Gordon, 1999; Green & Weinberg, 2001; Hutchinson et al., 2009; Kvist et al., 2005; Leddy et al., 1994; Podlog et al., 2011).

Post-traumatic stress and injury. Negative reactions following a serious injury may even cause severe emotional disturbances similar to trauma. Posttraumatic Stress Disorder (PTSD) refers to the psychological stress that may occur as a result of a traumatic experience (Andreasen, 2011). An experience is considered traumatic if it involves exposure to actual or threatened death, serious injury, or sexual violence (American Psychiatric Association [APA], 2013). There are many criteria one must meet in order to be diagnosed with PTSD, as listed in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; APA, 2013). Symptoms of PTSD include "recurrent, involuntary, and intrusive distressing memories, recurrent distressing dreams, dissociative reactions in which the individual feels or acts as if the event was recurring, intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble the event, and marked psychological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic events" (APA, 2013, p. 271). Symptoms also include "persistent avoidance of stimuli associated with the traumatic event… negative alternations in cognitions and thoughts associated with the traumatic event, and… marked alterations in arousal and reactivity associated with the traumatic event" (APA, 2013, pp. 271-272).

After suffering an injury, athletes experience many symptoms of posttraumatic stress as well (O'Connor, 2010). In a study by Shuer and Dietrich (1997) on 280 Division 1 athletes, participants were given the Impact of Event Scale evaluating an event where the athlete suffered an injury to determine if the reaction was comparable to other situations where people may experience PTSD. When the athletes' scores were compared to those who were victims of natural disasters, the authors found that athletes scored significantly higher on the avoidance/denial subscale of the survey (Shuer & Dietrich, 1997). Scoring higher on the avoidance/denial subscale indicated that athletes were more likely to dissociate from thoughts about their injury and experience denial regarding consequences and effects of their injury (Shuer & Dietrich, 1997). The authors attributed this finding to the unexpected nature of an athletic injury, as it typically occurs without warning. The authors discussed that athletes often try to suppress any negative feelings associated with the injury because they are in denial and lack the appropriate coping mechanisms to deal with the injury (Shuer & Dietrich, 1997). When athletes choose to be avoidant after suffering an injury, they are likely unable to completely avoid all stimuli related to injury, which creates cognitive distress surrounding the injury (Shuer & Dietrich, 1997). Therefore, athletic injury, particularly serious athletic injury, could be categorized as a trauma for athletes who strongly identify with being an athlete, because it can be a highly stressful occurrence.

Stress-Related/Posttraumatic Growth

A concept that has emerged from the field of positive psychology, *posttraumatic growth*, is the positive contrast to PTSD after trauma (Tedeschi & Calhoun, 2004). Posttraumatic growth (PTG), sometimes called stress-related growth (SRG), refers to the positive change that may occur as a result of facing a traumatic event or crisis (Tedeschi & Calhoun, 2004). "PTG" is used

to describe the experience of someone who recovers positively from trauma or stress and grows psychologically or physically as a result of the experience (Tedeschi & Calhoun, 2004). The largest difference between the concepts of PTG and SRG is whether or not the adversity is considered a trauma (PTG) or merely a stressor (SRG; Park, Cohen, & Murch, 1996). Something that may result in distress but is not a rare occurrence is considered a stressor, whereas something that happens rarely, such as an extreme accident, is more likely to be considered a trauma (Park et al., 1996). However, both PTG and SRG can result in the same growth and learning outcomes (Park et al., 1996).

There is a large amount of evidence, both quantitative and qualitative, that PTG and SRG may exist for people after experiencing adversity (Podlog & Ecklund, 2006; Udry, Gould, Bridges, & Beck, 1997; Wadey, Evans, Evans, & Mitchell, 2011). However, growth after trauma does not occur for everyone, as there are many people who face adversity but do not experience growth. Although people define growth differently, those who experience growth tend to report it in one or more of three categories: physical growth, psychological growth, and personal growth (Sarkar, Fletcher, & Brown, 2015; Udry et al., 1997). Physical growth often occurs after a physical injury or accident occurs; for example, someone might find themselves physically stronger in other ways or learn a new way to accomplish something their injury was preventing them from being capable of (Udry et al., 1997). Psychological growth may manifest by developing a new perspective on life, a new appreciation for a person's support system, greater resilience, or better preparedness for future challenges (Udry et al., 1997). Personal growth after injury could include outcomes such as people developing more empathy or bettering social and romantic relationships (Udry et al., 1997).

While three broad categories of physical, psychological, and personal capture any type of growth one may experience, some researchers argue that there are more specific ways in which people experience growth after trauma or stress (Tedeschi & Calhoun, 1996). Tedeschi and Calhoun (1996) identified five areas in which growth is observed after trauma. They state that the five detailed categories in which growth may occur are: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life (Tedeschi & Calhoun, 1996). Relating to others may occur as improved quality of relationships or increased ability to empathize; new possibilities may result from a change in perspective or new goals as a result of the experience (e.g., helping people who will go through a similar experience); personal strength refers to a personal trait which is often observed as being more prepared for future adversities (Tedeschi & Calhoun, 1996). Spiritual changes occur when one's spirituality or religious beliefs are strengthened by the incident; and appreciation for life indicates an increased value placed on life and gratitude for new aspects of life (Tedeschi & Calhoun, 1996).

As stated previously, it is clear that growth is possible and prominent after trauma; however, research is inconclusive regarding why some people experience growth and others do not (Sarkar et al., 2015). In attempting to answer the question of how and why growth occurs, exploring traits that may determine whether or not someone experiences growth is one direction studied in the research (e.g., Bensimon, 2012; Levine, Laufer, Stein, Hamama-Raz, & Solomon, 2009; Salim et al., 2015). For example, trait researchers have investigated the connection of PTG to trait resilience. *Resilience* refers to one's ability to positively adapt in the face of adversity or challenge (Galli & Gonzalez, 2015). Bensimon (2012) found resilience to be positively associated with PTG, while others found an inverse relationship between resilience and PTG (e.g., Levine et al., 2009). Bensimon (2012) explored the relationship between trauma, PTSD and

PTG in 500 Israeli college students, where PTG was defined as a mode of adjustment that led to being overly optimistic in the face of adversity. Findings indicated that the occurrence of trauma increased both PTSD and PTG and that when a traumatic event was combined with trait resilience, growth increased (Bensimon, 2012). Conversely, Levine and colleagues (2009) explored the relationship between resilience and PTG. A group of 2,908 Israeli citizens who had been exposed to violence and trauma were assessed on stress reaction to trauma, resilience, and PTG. Results indicated that resilience and PTG had an inverse relationship; that those who were high in resilience did not experience growth, and that those who were low in resilience experienced growth (Levine et al., 2009). The authors suggested that this inverse relationship was a result of the nature of resilience itself, that people who are resilient do not experience PTSD, and therefore may have less room to experience growth. These inconsistent findings indicate that more research is needed to determine the role resilience may play in posttraumatic or stress-related growth.

A second trait that may be connected to stress-related growth is hardiness. *Hardiness* has been defined as the tendency to take a devastating experience and turn it into an experience of growth and improvement (Salim et al., 2015). Salim and colleagues (2015) explored the relationship between hardiness and stress-related growth through semi-structured interviews with 10 injured athletes high in hardiness and 10 low in hardiness, knowing that those high in hardiness experienced SRG and the others did not. Throughout the interviews, the authors identified four themes in both groups: emotional trauma, emotional outlet, subsequent responses, and resultant outcomes (Salim et al., 2015). Each group of injured athletes had different experiences that could be categorized in each area. Those high in hardiness expressed the benefit of having an emotional outlet throughout their injury, while those low in hardiness discussed

their experiences of purposely avoiding discussing their injury with others in an effort to avoid seeming weak or soft (Salim et al., 2015). The presence of an emotional outlet was the most significant difference the authors indicated between the two groups. Those who had an emotional outlet said that their outlet helped them to reframe their injury or find other positive ways to spend their time. Overall, those high in hardiness experienced physical, psychological, and behavioral growth; while those low in hardiness often returned to playing too early, reinjured themselves, or had poor sport performances once they returned (Salim et al., 2015).

Growth and disease/illness. In the literature, posttraumatic growth has been correlated with illness and disease. For example, Cordova, Cunningham, Carlson, and Andrykowski (2001) compared breast cancer survivors with age and education-matched healthy women on depressive symptoms, overall well-being, and posttraumatic growth. The study included 70 breast cancer survivors and 70 healthy-matched women who completed a variety of questionnaires regarding social support, depression, wellbeing, and posttraumatic growth. The authors found that breast cancer survivors had higher levels of posttraumatic growth. Talking about their breast cancer in the past and experiencing PTSD as a result of their cancer diagnosis both positively predicted the growth among survivors (Cordova et al., 2001). Breast cancer survivors also had similar levels of depression and well-being to healthy women; however, those women who perceived their breast cancer as a threat to their life experienced more posttraumatic growth (Cordova et al., 2001).

In another study on breast cancer patients, Soo and Sherman (2014) surveyed 185 women. The participants answered questions regarding rumination, depression, social support, and post-traumatic growth. While all participants were determined to have PTG to some degree, PTG was sometimes seen in participants who also had symptoms of depression and anxiety (Soo & Sherman, 2014). This finding demonstrates that depression and PTG are not mutually

exclusive. Notably, the authors found that actively processing content and relating to others were both positively associated with PTG (Soo & Sherman, 2014).

Exploring the role that stress plays in a person's potential for growth is another area of past research. Groarke, Curtis, Groarke, Hogan, Gibbons, and Kerin (2017) explored the role stress and distress played in predicting PTG in women with breast cancer. The 253 participants were surveyed at the time of their diagnosis and then at four follow-up meetings regarding cancer-specific stress, global stress, depression, and anxiety. PTG was included in the surveys given at each of the follow-up appointments. The authors found evidence that high cancer-specific stress at diagnosis predicted higher PTG six months later; in contrast, high global stress was linked to lower levels of PTG (Groarke et al., 2017). The results also supported the idea, found in previous research, that PTG facilitates the reduction of stress over time (Groarke et al., 2017). The authors interpreted this reduction of stress as post-traumatic growth helping to reduce the perception of stressors in the future (Groarke et al., 2017). Overall, research provides strong evidence that cancer patients are able to experience post-traumatic growth after suffering through the trauma of cancer.

In addition to breast cancer, researchers have also explored posttraumatic growth in people with human immunodeficiency virus (HIV). Satheesan and Hameed (2017) assessed the personality traits of women diagnosed with HIV and examined the relationship between personality traits and posttraumatic growth. The population included 30 women diagnosed with HIV between 30 and 40 years old. The results indicated that the women's personality traits before the trauma had an effect on the way they experienced trauma. Specifically, high openness to experience and high agreeableness were the personality characteristics that positively influenced growth (Satheesan & Hameed, 2017). Similarly, in a systematic review regarding

research exploring post-traumatic growth in people living with HIV, Amos (2015) synthesized previous research on this population. Four themes regarding growth were consistently indicated across the research; reconsideration of self, reordering of values, redefinition of purpose, and reconstruction of time (Amos, 2015). Reconsideration of self refers to participants' ability to see potential in themselves and their abilities, increased understanding of self, and a more positive sense of self as a result of PTG. Reordering of values often included making one's own health more of a priority and establishing a stronger connection to life, specifically in relationships. Participants who indicated redefining purpose as one aspect of PTG re-evaluated their life goals and had a larger desire to positively contribute to the lives of those around them. Finally, reconstruction of time referred to both an increased value of time and an increase in reflection on the past (Amos, 2015).

Growth and injury. In addition to growth after disease and illness, positive growth also may occur after physical injury. There is empirical evidence that supports the concept that the type of positive growth is dependent on the type of traumatic experience it results from (e.g., Hefferon, Grealy, & Mutrie, 2009; Hefferon, 2012; Mutrie, 2012). Specifically, growth from physical trauma may be different from growth after a psychological traumatic experience (Hefferon et al., 2009). Hefferon and colleagues (2009) also suggested that physical injury is different from psychological trauma because of the need to physically reconnect with the body in order to recover, which may result in increased appreciation for the body, heightened care for the body, and more health behavior changes (Hefferon, 2012). Hefferon (2012) termed this recovery through reconnecting with the body as *corporeal posttraumatic growth*. The theory of corporeal posttraumatic growth specifically implies that any trauma caused to or involving the body

involves a different path to PTG than other types of trauma due to the impact on both the mind and body and the physical recovery required to move forward (Hefferon, 2012).

Researchers have attempted to explain why posttraumatic growth occurs after physical injury. Kampman, Hefferon, Wilson, and Beale (2015) used qualitative research and interviews to create a grounded theory regarding the connection between posttraumatic growth and physical injury. The authors found four themes essential to the outcome of PTG after injury including existential reflection, humanity, meaningful leisure engagement, and new abilities (awareness of physiological and psychological potential) (Kampman et al., 2015). Existential reflection was observed with people questioning the meaning of life, along with an expanded appreciation for life as a result of experiencing the traumatic injury; this increased appreciation also led to a positive change in the quality of relationships (Kampman et al., 2015). The theme of humanity describes participants' reports of feeling more human after suffering a trauma; this theme was demonstrated by a reported change in their ability to empathize and feel for others (Kampman et al., 2015). Meaningful leisure engagement describes people reaching out to find new hobbies or new activities as a result of the trauma; this captured discovering new abilities or having a renewed appreciation for the body's capabilities (Kampman et al., 2015). Finally, awareness of physiological and psychological potential was coded when someone reported rethinking their abilities or developing a perspective different from the one they previously held. Participants also reported new psychological skills, as they dealt with the challenge of overcoming the injury and learning more about themselves; these skills included problem solving, mental toughness, patience, anxiety regulation, and more (Kampman et al., 2015). Researchers have established that traumas involving physical injury can also result in growth. Similar themes connected to growth have been discovered in the reported experiences of other injured participants. Khanjani,

Younesi, Khanjeh, and Azkhosh (2017) explored factors that can contribute to the post-traumatic growth of patients with spinal cord injuries. Semi-structured interviews were used to explore the experiences of 16 Iranian patients with spinal injuries, who had been successful in their recovery. Those who experienced posttraumatic growth had many areas in which they were given support and resources. These effective resources include having contact with and social support from other patients with injuries, spiritual beliefs, having a positive attitude toward injury, access to proper facilities, knowledge and awareness of injury, and social participation (Khanjani et al., 2017). Based on these studies, it appears that in order to experience growth after trauma, factors such as having various resources of support and the outlook people have about their trauma, may be important in determining its consequences.

Growth and athletic injury. Injuries sustained by athletes while participating in sport may also result in PTG. Researchers have explored what the experience of posttraumatic growth entails in term of sport injuries specifically. In interviews with 10 previously injured adult male athletes who played rugby, soccer, or basketball, researchers explored the participants' perspectives on positive benefits from their injury (Wadey et al., 2011). Athletes reported growth in the form of positive consequences of injury, such as: renewed perspective, better appreciation (e.g. improved relationship with coach), realization of the importance of sport (e.g., increased dedication to their sport), increased motivation (e.g., improved work ethic), increased passion, enhanced performance and mental toughness, increased efficacy, increased sport confidence, and increased ability to empathize (Wadey et al., 2011). In another qualitative study involving 37 British adult athletes who played a variety of sports at a range of competitive levels, growth after injury meant something different to all athletes, but growth included positive changes in areas of intelligence, social relationships, personal strength, self-acceptance, pro-social behavior, and a

new purpose and appreciation for life (Roy-Davis, Wadey, & Evans, 2017). Overall, athletes were able to experience growth in many ways as a result of various internal and external factors.

When coping with an injury, athletes often find that they struggle with loss of self and, therefore, loss of resources (Ford & Gordon, 1999). However, in reaction to losing resources, athletes also may gain some resources as they recover from their injury. Ford and Gordon (1999) studied four athletes, two male athletes who competed in Australian football at the national level and two females, one who played regional volleyball and one who played recreational basketball, suffering from knee injuries that required surgery. Researchers found that some resources the athletes gained were improved relationships with others, particularly those who are supportive and helpful, and an increase in time to do other things, therefore increased accomplishments in areas outside of sport (Ford & Gordon, 1999). Athletes may also gain an appreciation and attention to their body; experiencing an injury increases their awareness of health and any precautions taken to avoid injury (Ford & Gordon, 1999). In an effort to develop a grounded theory exploring the relationship between sport injury and *sport injury-related growth* (SIRG), Roy-Davis and colleagues (2017) interviewed 37 British athletes injured from various sports (rugby, football, endurance events, rowing, tennis, etc.) at all different stages of their recovery. The interviews explored their experience with injury and the changes that occurred as a result of that injury. The findings indicated that for SRG to occur, resources were needed to enable certain cognitive processes. For example, athletes were more likely to experience SRG if they had prior dispositions to characteristics such as optimism and creativity, physical resources such as a rehabilitation facility, previous personal experience of adversity, emotion and problem-focused coping capabilities, social support, and access to similar narratives of other people that resulted in positive outcomes (Roy-Davis et al., 2017). It appears that there are several influencing factors

in SIRG, however, perhaps there could be an underlying theory that can be utilized to explain these factors.

Research indicates that stress-related growth is not only acknowledged by athletes; coaches are also able to identify positive growth in their athletes after injury. Wadey, Clark, Podlog, and McCoullough (2013) interviewed eight coaches in the United Kingdom (UK) with an average of 17 years coaching experience regarding the positive growth they noticed in their athletes following an injury. While all of the coaches agreed that athletic injury is a negative occurrence, they also agreed that they have seen growth in athletes who have overcome injury and returned to their sport. Coaches indicated that they noticed psychological growth in sporting qualities, such as an increase in confidence or motivation, and cognitive coping, for example being able to put things in perspective, in their athletes who has suffered injuries. These coaches also reported an increase in the quality of the coach-athlete relationship after an athlete is injured (Wadey et al., 2013). Factors that coaches believed were indicative of growth were changes in general demeanor, improved health, increased empathy, behavioral coping, and sport performance (Wadey et al., 2013). Overall, coaches have recognized some positive effects in athletes after an injury, particularly psychologically growth.

When studying athletes who have experienced injury, the timing and manner in which athletes are questioned about growth post-injury may also have an effect on how their experience was perceived. For example, athletes who have recently had surgery and cannot walk are less likely to say they had experienced growth than someone who recovered two years ago and is healthy. Also, asking questions specifically looking for positive growth may prompt athletes to feel obligated or pressured to say that they have experienced growth when in fact they have not (Wadey et al., 2011). The same can be applied when asking athletes about negative

consequences of their injury. Instead, asking neutral questions about their experiences, rather than looking specifically for negative or positive effects, is the best way to learn how they really feel about their experience (Podlog & Ecklund, 2006). It is also important to note whether or not the central question is subjective or objective: whether or not the athlete indicates growth on surveys taken before and after the injury, or whether or not the athlete themselves feel they have grown, or if their coaches, family members, and teammates see the growth (Park et al., 1996). Regardless of the measure, objective or subjective, growth may occur after athletic injury and other athletic stressors; in fact, some athletes view the adversity they faced as the reason for their success later in their career (Sarkar et al., 2015). Sarkar and colleagues (2015) interviewed Olympic gold medalists about their experiences of adversity (e.g., non-selection, sporting failure, serious injury) that they found to be instrumental in their successes in sport. The athletes all claimed that the adversarial events ignited their motivation and stimulated learning (Sarkar et al., 2015). Growth was experienced by the athletes in five major categories: appreciation for life, improvements in relationships (e.g., increased empathy), increased personal strength, recognition of new possibilities (e.g., appreciation for new learning opportunities), and spirituality (Sarkar et al., 2015). The athletes reported that without the adverse experiences, they doubted they would have had the performance successes in sport that they did.

While it is evident that positive growth after injury is possible for injured athletes, the question of how and why it occurs still remains. Past research has identified growth but has been less definitive about why it happened or how to influence it. The literature is also missing studies on groups of athletes with similar types of injuries; the large variance of participants' injuries within the same studies in past research may impact the results that come from these groups. Research using a more homogenous group of injuries (i.e., time away from sport, type of injury,

body part injured, if surgery was required, etc.) may be helpful (Brewer, 2012), as different types of injuries may result in different types of growth. More research is needed to understand how to influence growth for athletes struggling with injury and how to apply established theoretical frameworks to understand why SIRG occurs.

Self-Determination Theory

Ryan and Deci (2000) developed a theory of motivation called self-determination theory (SDT) that highlights and explains various sources of motivation, ranging from intrinsic motivation that draws on the internal desire to do something, to external regulation that is motivation coming from an external source, reward, or punishment. The theory is based on the human drive for the fulfillment of three basic psychological needs: autonomy, relatedness, and competence (Ryan & Deci, 2000). According to Ryan and Deci (2000), autonomy refers to one's independence and feeling of choice in the given situation. For example, if the athlete is making choices about their training and feels they are in control of their participation, their autonomy need is satisfied. Relatedness refers to how one feels about their connections with others (Ryan & Deci, 2000). When applied to sport, an athlete who feels that they belong among their teammates would have their relatedness need fulfilled. Finally, competence refers to one's self-efficacy and perceived ability to be successful at the task at hand; for example the competence need is fulfilled if an athlete feels that they are capable and skilled in their sport (Ryan & Deci, 2000). Deci and Ryan (2008) theorized that if a person's three needs are fulfilled in a given situation, they will likely be intrinsically motivated in that situation. Intrinsic motivation is the motivation that comes from loving and enjoying an activity, such as doing something for the satisfaction or challenge that comes with it, rather than because of an expected consequence or internal pressure. If the person's needs are not fulfilled, motivation is regulated through sources

other than internal desire (Deci & Ryan, 2000). Some regulatory types are more self-determined (integrated, identified), than others (introjected, external; Ryan & Deci, 2000).

Organismic valuing theory (OVT), a sub theory of SDT, stipulates that all humans have the same needs and when the three psychological needs are satisfied, positive wellbeing is promoted (Wadey, Podlog, Galli, & Mellalieu, 2015). Together, SDT and OVT state that when the three needs are satisfied, a person is more likely to be intrinsically motivated and have an overall positive wellbeing. Ryan and Deci (2000) discussed the importance of need satisfaction, not only for its connection to sustained motivation, but to its contribution to overall wellbeing. The opposite of need satisfaction is *need frustration* (Vansteenkiste & Ryan, 2013). It is important to differentiate between an unsatisfied need and a frustrated need. If a person's competence need is not satisfied, they are missing the feelings of success and the feeling that they are proficient at what they do. However, if the competence need is frustrated, they feel that they are unsuccessful and incapable, which can lead to feelings of anger and depression (Vansteenkiste & Ryan, 2013). A need that is not satisfied is not as problematic as a frustrated need (Vansteenkiste & Ryan, 2013). While need satisfaction leads to overall wellbeing, need frustration leads to ill-being and malfunctioning (Vansteenkiste & Ryan, 2013). Need frustration is related to need thwarting. *Need thwarting* refers to situations where someone's needs are prevented from being satisfied by a person or group (Bartholomew, Ntoumanis, Ryan, & Thogersen-Ntoumani, 2011). Bartholomew and colleagues (2011) explored the potentially negative side of basic need satisfaction in the sport context. The results supported the authors' prediction, that the British coaches and teenage athletes who participated in the study recognized that sport was both an opportunity for empowerment and need satisfaction (Bartholomew et al., 2011). Participants acknowledged that sport was also an environment where need thwarting was

very common, which came with the pressure to reach performance-related goals or having a controlling coach (Bartholomew et al., 2011). The athletes revealed that sport involved many high-pressure situations that left them feeling controlled, incompetent, and rejected (Bartholomew et al., 2011). This study illuminated the ways in which their needs are thwarted, typically due to the controlling nature of others or the high-pressure situations of performing. Basic need satisfaction, as well as need frustration or thwarting, may be the theoretical framework that can explain the potential for an athlete's growth response to injury.

Self-determination theory and sport injury. SDT is a prominent theory used in research studying athletes as they return to sport following a serious injury. Podlog and colleagues (2013) studied the influence psychological need satisfaction has on return to sport by interviewing 11 adolescent athletes who experienced serious injury. These athletes (8 females, 3 males) ranged from 12 to 17 years old and suffered musculoskeletal injuries that required physiotherapy treatment and at least a one-month absence from sport. Four key themes emerged from the interviews as influencers on an athlete's experience of injury and experience: injury stress, referring to how stressful the athlete found their injury; coping strategies, whether the athlete used problem-focused, emotion-focused, or avoidance coping; social support, the athletes emphasized that support they had from others was crucial to their success; and recovery outcomes, particularly whether or not the athlete considered their recovery a success or not. Findings indicated that satisfied competence and relatedness psychological needs were most important to the athletes' own positive feelings regarding their overall injury experience (Podlog et al., 2013). In regard to the competence need, the authors found that the athletes were preoccupied with questions regarding their abilities and their proficiency to return to sport; reducing uncertainties about the injuries helped to satisfy the need for competence. The

researchers found relatedness need fulfillment in athletes finding comfort in social networks while coping with injury, as the athletes felt isolated from their team while they were injured and missed the comradery that came with participation (Podlog et al., 2013). These findings are consistent in the literature. For example, Podlog, Lochbaum, and Stevens (2010) explored the impact basic psychological need satisfaction may have on athletes' experiences returning to sport after injury. Podlog and colleagues (2010) surveyed 204 injured athletes and found that satisfaction of the three basic needs increased positive return-to-sport outcomes. The authors also found that autonomy, perhaps, was not as important a need to fulfill during injury rehabilitation because athletes were willing to give up control to their doctors and other experts. Although the number of research findings are limited, fulfilling the three basic psychological needs appears to be influential in improving the experience of injured athletes. Further research is needed to explore the fulfillment and frustration of psychological needs during injury to determine which of the needs are effective in facilitating growth.

Additional research has examined the three basic psychological needs in relation to injury experience and overall wellbeing. Podlog and Ecklund (2006) interviewed Australian athletes three or four times throughout their injury recovery. The interview questions were focused on their experiences and psychological issues when transitioning from injury rehabilitation to returning to play. Their analysis determined that SDT is a viable framework to use in exploring PTG further, as all three basic psychological needs were coded in the athletes' responses to the interview questions (Podlog & Ecklund, 2006). Next, Podlog and Ecklund (2010) studied 225 male athletes who participated in the Australian Football League to explore the emotional reactions and feelings of injured athletes in regard to returning to sport. The participants had a mean age of 22.1 years and had a self-reported injury that required an absence from sport

participation. The average time away from sport was four to eight weeks and 45% of participants had an injury that required surgery (Podlog & Ecklund, 2010). The athletes were given hypothetical scenarios where aspects of re-injury and self-determination were manipulated to measure their emotional reactions to each scenario. Based on participants' responses to scenarios, the researchers concluded that greater need satisfaction resulted in greater positive affect and more positive appraisals of the situations (Podlog & Ecklund, 2010). These results support the idea that SDT is important to consider when examining at injured athletes and that there are psychological benefits to need satisfaction and fulfillment in athletic rehabilitation (Podlog & Ecklund, 2006; Podlog & Ecklund, 2010). One factor missing from this research is an assessment of need frustration, which could be valuable insight into these experiences, as need frustration is more than just the opposite of need satisfaction because it identifies if there is anything preventing the need from being satisfied.

It appears that the type of motivation one has, which is directly influenced by need satisfaction or frustration, may have an impact on whether or not growth is facilitated for an athlete. Podlog and Ecklund (2005) found that athletes (N = 180) competing in sport at universities, internationally, nationally, and professionally with intrinsic motivation to return to sport also had a renewed perspective on sport after injury (Podlog & Ecklund, 2005). They concluded that athletes with intrinsic motivation have a more positive experience returning to sport after injury because being intrinsically motivated aligned with valuing growth and improvement (Podlog & Ecklund, 2005).

Stress-related growth and self-determination theory. Some researchers have explored the connection between both self-determination theory and stress-related growth in people after suffering a trauma outside of sport. Two studies using the Posttraumatic Growth Inventory

(PTGI; Tedeschi & Calhoun, 1996) used an SDT framework to examine the relationship between need satisfaction and post trauma growth (Lumb, Beaudry, & Blanchard, 2017; Yeung, Lu, Wong, & Hunyh, 2016). Lumb and colleagues (2017) explored the relationship between PTG and SDT after the loss of a loved one. Participants from an introduction to psychology class took surveys measuring posttraumatic growth, motivation, depression, and wellbeing. Lumb and associates (2017) found that those with autonomous motivation were more likely to experience growth; however, the authors emphasized that experiencing a loss or any other trauma is not a determinant of growth. Two people may experience the same traumatic situation and have very different experiences of growth, which is likely due to the use of different coping mechanisms (Lumb et al., 2017). Similarly, Yeung and colleagues (2016) explored psychological factors that promote PTG after a negative life experience by surveying 454 college students. Results suggested that there was a positive correlation between the satisfaction of all three basic needs with PTG, however only relatedness was significantly positively associated with PTG in the regression analysis. The authors concluded that facilitating an environment where needs are satisfied promotes PTG (Yeung et al., 2016). While there is evidence of a positive relationship between posttraumatic growth and basic psychological need satisfaction, the findings are limited due to the fact that there are only two studies and both have participant groups with varied experiences that are considered the trauma in which the growth evaluation is based on. Additionally, there is only one known study related to sport.

While research that uses self-determination as a theoretical framework is prominent regarding athletes returning to sport following injury, there is only one known study that uses self-determination theory to connect stress-related growth after an athletic injury. In that study, Wadey and colleagues (2015) explored stress-related growth after sport injury and its relation to

self-determination theory, specifically with organismic valuing theory. This study included 520 British and American athletes (316 males, 204 females) from 39 sports who experienced injury removing them from sport for at least four weeks. The injury had to occur within the previous two years and the athlete had to have already made their return to playing sport. Participants completed surveys including the Need Satisfaction Scale (Podlog et al., 2010), measuring whether or not their three needs were met during injury rehabilitation, the Stress-Related Growth Scale (Park et al., 1996), and the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). Results indicated that there was a positive correlation between need satisfaction and stress-related growth. Both relatedness (r = .15) and competence (r = .22) had a positive, significant correlation with stress-related growth. Autonomy (r = .09) had a weaker positive correlation to stress-related growth, likely because athletes found that they trusted and relied on their physicians enough to not need to feel autonomous and make decisions regarding their injury rehabilitation (Wadey et al., 2015). While this study examined the relationship between need satisfaction and stress-related growth in injured athletes, the authors only explored need satisfaction and only in the rehabilitation setting. Going forward, both need satisfaction and need frustration should be explored in order to gain more insight into athletes' full experiences of injury; it is important to know if needs are being frustrated and if that frustration impacts whether or not someone experiences growth in the future. Also, needs should not only be explored in the rehabilitation setting, but in the athletes' lives in general. Perhaps athletes' needs are fulfilled outside of sport while they are in rehabilitation due to the nature of being injured, however this can still influence one's motivation to recover. Additional research should also use more homogenous samples in terms of injury type among participants. Previous research includes any type of traumatic experience (Yeung et al., 2016) or any type of athletic injury (Wadey et al.,

2015); these broad groups include various experiences that may not be comparable to one another, as different types of injuries may result in different types of emotional consequences (Brewer, 2012), which may include growth. Therefore, a participant group with more similar injury experiences is needed to eliminate this variance. Finally, further research is needed to support and solidify the findings on the relationship between SRG and basic psychological need satisfaction; additional research may inform possible interventions for applied work with athletes as they cope with injury.

Summary

This review has presented evidence that positive growth, termed stress-related growth, is possible after serious athletic injury (Podlog & Ecklund, 2006; Roy-Davis et al., 2017; Sarkar et al., 2015; Udry et al., 1997; Wadey et al., 2011). While researchers have been able to demonstrate that growth is possible, it is relatively unknown what precedes the experience of growth (Wadey et al., 2015). Only one study has attempted to connect stress-related growth to self-determination theory, in an effort to help practitioners establish an environment where growth can be encouraged, rather than occur at random (Wadey et al., 2015). The present study aimed to explore the relationship of stress-related growth and basic psychological need satisfaction and frustration after athletic injury both in and out of a rehabilitation setting and to further explore the specific sources of that need satisfaction and frustration.

Introduction

Approximately 8.6 million sport and recreation-related injuries occur every year in the United States (Sheu, Chen, & Hedegaard, 2016). Sport injury may result in many different physical and psychological outcomes and emotional reactions from an athlete (Udry, 1997). Each person's emotional response to injury is unique, and everyone copes in a distinct manner (Shapiro et al., 2017). According to both the transactional theory of emotions and coping and the sport-specific injury response model, athletes' appraisals of their injuries determine their subsequent emotional, coping, and behavioral responses (Lazarus & Folkman, 1987; Udry, 1997). If athletes appraise their injuries as a threat to their career or identity, the emotional response that follows will likely be negative (Brewer, 1993; Udry, 1997). However, not all athletes have a negative response to injury, as those with positive mood state profiles before injury often have a more positive emotional and behavioral response than those with a more negative mood state (Wiese-Bjornstal et al., 1998).

Injuries not only affect athletes physically, but also psychologically (Hefferon, 2012). Physical injuries are unique to other experiences of trauma because they may require simultaneous physical and psychological recovery (Hefferon, 2012). Injury may trigger a variety of psychological reactions for the sufferer, including depression, loss of identity, decrease in self-esteem, and anxiety, all of which may be influenced by injury severity and levels of social support (Brewer, 1993; Ford & Gordon, 1999; Green & Weinberg, 2001; Masten et al., 2014; Podlog et al., 2011; Smith et al., 1993). Negative reactions to injury may even mimic symptoms of Posttraumatic Stress Disorder (PTSD; American Psychiatric Association, 2013), including reexperiencing the event, disturbances in arousal and cognitive or mood symptoms, and diminished interest in activities.

Although there are many negative outcomes possible after suffering an injury, positive outcomes may also occur. Posttraumatic growth (PTG), sometimes referred to as stress-related growth (SRG), is a positive change that may occur as a result of experiencing a trauma or stressor (Tedeschi & Calhoun, 2004). Based on past qualitative research by Tedeschi and Calhoun (1996), growth after adversity appears to occur in not only one area, but multiple categories, including: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life. The authors defined the theme relating to others from peoples' reports of improved quality of relationships or increased ability to empathize; new possibilities may result from a change in perspective or new goals because of the injury experience (e.g., helping people through a similar experience). Further, personal strength referred to an enhanced personal trait, which participants described as being more prepared for future adversities. Finally, spiritual changes were coded by the authors when one's spirituality or religious beliefs were strengthened by the incident; appreciation for life indicated an increased value on life or gratitude for new aspects of life. In sum, Tedeschi and Calhoun (1996) identified five life areas where growth may occur following adversity. However, it remains unclear as to why some people experience growth and others do not (Sarkar et al., 2015).

Personality traits may be predecessors to experiencing stress related growth. One trait that has been examined in relation to SRG is resilience, or the ability to positively adapt in the face of adversity (Galli & Gonzalez, 2015). Findings on resilience and growth have been inconsistent. Bensimon (2012) found that posttraumatic growth was more likely to occur when a resilient person experienced a trauma. Conversely, Levine and colleagues (2009) theorized that people who were resilient would be less likely to have symptoms of PTSD, and, therefore, would be less likely to experience growth. Another trait that has been researched is hardiness, which is

the ability to take difficult experiences and turn them into opportunities of growth and improvement (Salim et al., 2015). Researchers found that athletes who were high in hardiness were more likely to experience growth than those low in hardiness (Salim et al., 2015).

In an attempt to identify situations in which posttraumatic growth occurs, researchers have studied people who have experienced life-changing events, such as illness, or injuries. For example, researchers have found that breast cancer survivors have higher levels of posttraumatic growth than their healthy age-matched controls (Cordova et al., 2001) and that growth occurred even in patients who also experienced depression (Soo & Sherman, 2014). Furthermore, participants who experienced more growth were those who also viewed their cancer as a more serious threat (Groarke et al., 2017). In a study involving patients with spinal cord injuries, researchers discovered that many factors, such as social support, having a positive attitude, and access to resources increased the occurrence of growth (Khanjani et al., 2017). These research findings confirm that growth occurs in many different situations, both in cases where the traumatic event has serious negative psychological consequences and in cases where the person maintains a positive attitude.

Growth is not only observed in these traumatic events that pose serious threats to one's life, but it also occurs in instances of athletic injury. In various studies, athletes reported growth in the form of positive consequences after injury such as: renewed perspective, better appreciation of life, realization of the importance of sport (e.g., increased dedication to their sport), increased motivation (e.g., improved work ethic), increased passion, enhanced performance and mental toughness, increased efficacy, increased sport confidence, and an increased ability to empathize (Podlog & Ecklund, 2006; Udry et al., 1997; Wadey et al., 2011). Growth after injury has been reported by Olympic gold medalists (Sarkar et al., 2015), high-level

coaches (Wadey et al., 2013), and athletes of various levels of competition (Park et al., 1996; Podlog & Ecklund, 2005; Roy-Davis et al., 2017).

In an effort to determine what influences stress-related growth, researchers have turned to a theory of motivation as a possible explanation. Self-determination theory (SDT; Ryan & Deci, 2000) is a theory of motivation that describes humans' inherent drive for the fulfillment of the three basic psychological needs: autonomy, relatedness, and competency. One's needs are fulfilled when a person feels a sense of control and choice (autonomy), feels a sense of connecting with people (relatedness), and when one's self perception is that of capable and skilled (competence; Ryan & Deci, 2000). When the three basic needs are satisfied, a person experiences intrinsic motivation and well-being (Ryan & Deci, 2000). Well-being refers to human flourishing and is indicated by factors such as self-esteem and achieving goals (Ryan & Deci, 2000). Intrinsic motivation is the motivation that comes from loving and enjoying an activity and doing it for the satisfaction or challenge that is associated with it (Ryan & Deci, 2000). Researching motivation in relation to injury recovery may be important, as Podlog and Ecklund (2005) found that an athlete's type of motivation was related to the occurrence of growth. The authors found that athletes ($N = 180$) competing in sport at the college, international, national, or professional levels with intrinsic motivation to return to sport also had a renewed perspective on sport after injury (Podlog & Ecklund, 2005). The authors concluded that athletes with intrinsic motivation have a more positive experience of injury because being intrinsically motivated aligns with valuing growth and improvement (Podlog & Ecklund, 2005).

While need satisfaction leads to increased intrinsic motivation, needs can also be unsatisfied or even frustrated (Vansteenkiste & Ryan, 2013). It is important to differentiate between an unsatisfied need and a frustrated need. A need that is not satisfied is not as

problematic as a frustrated need (Vansteenkiste & Ryan, 2013). When people's competence need is not satisfied, they lack feelings of success and the feeling that they are good at what they do. However, if the competence need is frustrated, they believe that they are unsuccessful and incapable, which can lead to feelings of anger and depression (Vansteenkiste & Ryan, 2013). While need satisfaction leads to overall well-being, need frustration leads to ill-being and dysfunction (Vansteenkiste & Ryan, 2013). Basic need satisfaction and frustration may provide a theoretical framework to explain the relationship of stress-related growth after athletic injury.

To date, two studies have examined the relationship between self-determination theory and stress-related growth. Yeung and colleagues (2016) found a positive relationship between need satisfaction and growth in 454 college students who had various traumatic experiences. More specifically, the authors found that relatedness was positively correlated with PTG. In a study of injured athletes, there was a positive correlation between need satisfaction and stress-related growth (Wadey et al., 2015). In that study, both relatedness and competence needs were positively correlated with positive affect and stress-related growth. Autonomy did not have a statistically significant correlation to growth as the other needs, which was explained by how likely the athletes trusted and relied on their physicians enough to not feel the need to be autonomous in injury rehabilitation decision making (Wadey et al., 2015).

Although Wadey et al.'s (2015) results offer insight, it is the only examination of the relationship between need satisfaction and stress-related growth in injured athletes. Therefore, it is necessary to determine if their results are replicated in other athlete samples. In addition, the study was limited to only examining need satisfaction (without any measures of need frustration) and only measuring need satisfaction within the rehabilitation setting (e.g., in the training room with their athletic trainer, their physical therapist, or other injured athletes) and did not specify

what types of injuries participants sustained. Both need satisfaction and need frustration should be explored not only in the rehabilitation setting, but in the athletes' lives in general, to gain a better understanding of the relationships between psychological needs and growth after injury. Perhaps athletes' psychological needs can be fulfilled outside of sport while they are in rehabilitation (e.g., in participation of other activities, at work, with family), which can influence the growth response. Currently, it is not clear where one has to experience need satisfaction to experience SRG; for example, there are no research findings that indicate that athletes would need their three basic needs satisfied in a sport-related setting in order for growth to occur. Additionally, both Yeung et al. (2016) and Wadey et al. (2015) recruited very broad participant groups; Yeung and colleagues (2016) surveyed undergraduate students who experienced all different types of trauma and Wadey and colleagues (2015) used athletes who experienced all different types of injuries. Research on more homogenous groups in terms of injury type is needed in order to learn more precise information about athletes' experiences (Brewer, 2012), as the varying injuries used in the previous research may result in different experiences of growth. Further, it is unknown how need frustration is related to SRG after athletic injury. By studying the relationships between stress-related growth and basic psychological need satisfaction and frustration, there is potential to inform future interventions for injured athletes to promote SRG after injury with intention.

The purpose of this study was to explore the relationship between basic psychological need satisfaction and frustration and stress-related growth following a serious athletic injury as well as to explore sources of that need satisfaction. Athletes with a history of serious injury resulting from sport participation were measured on psychological need satisfaction and frustration and stress-related growth post-injury to identify the relationships between the

concepts. Based on previous literature, it was hypothesized that higher levels of basic psychological needs satisfaction while athletes were injured would predict higher levels of injury-related growth. A second hypothesis based on theory, was that high need frustration would predict less stress-related growth after suffering an athletic injury. A final hypothesis based on literature was that a larger number of weeks out from participation due to injury, would predict more growth than those who were out for less time.

Methods

Participants

Participants were 93 competitive athletes who had sustained a lower extremity, sport-related injury in the past five years. Participants sex at birth was 76.9% females and 20.4% male, with 12.9% reporting that their gender currently differs from birth sex. The age of participants ranged from 19 to 52 years old (M = 26.78, SD = 5.68). Participants' identified ethnicity included white (73.1%), multi-ethnic (15.1%), Asian (6.5%), Hispanic or Latino/Latina/Latinx (3.2%), Black or African American (1.1%), and Native Hawaiian (1.1%).

The participants of this study were athletes who engaged in the following sports: ultimate frisbee (50.5%), rugby (20.4%), soccer (10.8%), basketball (5.4%), baseball/softball (4.3%), football (2.2%), and 1.1% each of other sports (rock climbing, powerlifting, triathlon, cross country/distance running, gymnastics, and volleyball). Participants' injury locations were as follows: knee (50.5%), ankle (21.5%), foot (16.1), quad/hamstring (6.5%), other/multiple (2.2%), toe (1.1%), calf/shin (1.1%), and hip (1.1%). The types of injuries that the participants reported were: soft tissue damage (66.7%), broken/fractured bone(s) (19.4%), other/not sure (6.5%), combination/multiple (4.3%), cartilage injury (2.2%), and dislocation (1.1%). The number of weeks out of sport due to injury ranged from 4 to 104 (M = 23.97, SD = 19.19). Participants' age

at time of injury ranged from 16 to 50 years old (M = 24.6, SD = 5.68) and the time that has passed since the injuries occurred ranged from 5 to 260 weeks (M = 117.75, SD = 68.74).

Data Collection Measures

Participants completed self-report measures online via Qualtrics software: the 24-item Basic Psychological Need Satisfaction and Frustration Scale (BPNSF; Chen et al., 2015) and the 50-item Stress-Related Growth Scale (SRGS; Park, Cohen, & Murch, 1996). Directions for both the SRGS and the BPNSF were amended to instruct the participant to respond to each question based on their experience during the rehabilitation of their most serious injury within the previous five years, all elements of the surveys were changed to past tense to reflect the injury that occurred in the past.

Basic Psychological Need Satisfaction and Frustration Scale (BPNSF). The BPNSF (Chen et al., 2015) includes a 5-point Likert-type scale, ranging from 1 (*not true at all*) to 5 (*completely true*). The scale consists of six subscales: autonomy satisfaction (4 items) and frustration (4 items), competence satisfaction (4 items) and frustration (4 items), and relatedness satisfaction (4 items) and frustration (4 items). Higher scores on the BPNSF indicate higher levels of need satisfaction or need frustration. The BPNSF has had a Cronbach's alpha of .87 for total need satisfaction and .84 for total need frustration (Chen et al., 2015). Cronbach's alpha for each of the six subscales are as follows: autonomy satisfaction = .81, relatedness satisfaction = .83, competence satisfaction = .88, autonomy frustration = .71, relatedness frustration = .81, and competence frustration = .86 (Chen et al., 2015). For the present study, an average score for each of the six subscales from the BPNSF was used in the analysis. Additionally, total mean scores for the three satisfaction subscales and three frustration subscales were also used in the analysis. For the present study, the Cronbach's alpha was determined to be .787 for autonomy satisfaction,

.650 for autonomy frustration, .845 for relatedness satisfaction, .741 for relatedness frustration, .855 for competence satisfaction, and .769 for competence frustration.

Stress-Related Growth Scale (SRGS). The SRGS (Park et al., 1996) assesses stress-related growth with 50 items. The items measure how much a participant perceived positive outcomes as a result of a stressful event, in this case the directions were amended to refer to an athletic injury within the previous five years. The original survey questions that ask about God were amended to ask about spirituality in order to be more culturally inclusive. The scale utilizes a 3-point Likert-type scale, ranging from 0 (*not at all*) to 2 (*a great deal*). Scores are totaled ranging from 0, indicating very little growth, to 100, indicating high levels of growth. The SRGS has a reported Cronbach's alpha of .97 (Wadey et al., 2015). A total score for the SRGS was used in the current analysis. For the present study, the Cronbach's alpha for the SRGS was .974, which is very high.

Demographic and follow-up questions. Participants answered follow-up questions, created for use in this study, to discern the source of psychological need satisfaction during the time of injury rehabilitation. The questions included the definition of each of the three basic psychological needs and asked participants to recall whether or not they felt that each need was satisfied in major life areas (sport, rehabilitation, work/school, relationships, home, other) while they were in rehabilitation for their injury (Ryan & Deci, 2000). If the participant answered affirmative, they were asked to indicate what the sources of that need satisfaction were at the time. Participants were given a list of possible areas of need satisfaction (rehabilitation setting, sport, work, school, home, personal relationships, non-sport hobby, or other) and instructed to select all in which each need was fulfilled at the time of injury. Participants also completed a

survey regarding demographic information, including injury history, age, ethnicity, gender identity, sport, and competition level.

Procedure

In order to control for some homogeneity of the sample, the criterion of inclusion for this study included: a) participants at least 18 years old, b) competitive athletes, c) an experience of a lower body athletic injury (i.e., toe, foot, ankle, calf/shin, knee, quad/hamstring, hip) in the past five years, and d) at least four weeks of non-participation in sport due to the injury. The inclusion criteria was consistent with previously research which defined serious injuries as any physical impairment that caused an athlete to refrain from participation in a sport for at least four weeks (Wadey et al., 2015). In an effort to target competitive athletes who may have experienced stress as a result of their injury, athletes must have been playing in a competitive sport league organized by a national or international governing body (e.g., U.S. Adult Soccer, USA Rugby) at the time of injury, and eventually returned to competition post-injury. A target sample size of 106-114 participants was calculated based on the equation $n \geq 50 + 8m$ (Tabachnick & Fidell, 2013, p. 119).

Following institutional ethics approval, participants were recruited via email using a combination of sampling techniques in order to collect responses from a large number of athletes. Coach or league contact information was located on three organization websites: USA Ultimate, USA Rugby and US Adult Soccer Association. These associations were targeted given the potential for lower body injury. In blocks of 20, leagues and teams from each organization were selected from websites using stratified random sampling. In the first round of sampling, coaches or team contacts were sent emails describing the purpose of the study and asking them to forward the email to their teams in order to target any athlete who has ever suffered a serious

lower extremity injury. A total of 100 teams and 105 regional leagues were contacted from the three national organizations. A total of 231 individuals started the survey, 105 completed the survey, and 93 were usable responses (e.g., athletes who met each of the inclusion criteria and answered every survey question). Those who did not complete the survey most commonly did not meet all of the inclusion criteria, with the governing organization requirement most often excluding participants. Of those who completed the survey, but were not included in the analysis, most were excluded due to answering a demographic question in a manner that did not meet the inclusion criteria screened for at the beginning of the survey. The email included the link to the full questionnaire and informed consent hosted on Qualtrics. Next, snowball sampling was utilized by asking athletes who received the survey to forward the survey to any known athlete who met the inclusion criteria. Participants were also recruited via convenience and snowball sampling on social media (Facebook). All survey responses remained anonymous, with the exception of participants who wished to be included in a drawing to win one of four $25 Amazon gift cards.

Data Analysis

After performing basic correlational tests between each of the variables, two linear regressions were used in order to determine which dependent variable could uniquely explain a change in stress-related growth. The first regression included basic psychological need satisfaction, time away from sport due to injury, and time since injury occurred. The second regression assessed the frustration of each basic psychological need, time away from sport due to injury, and time since the injury occurred. These tests determined how much variance in stress-related growth was explained by need satisfaction and frustration, time away from sport, and time since injury occurred, as well as which variable was the best predictor of stress-related

growth. Frequencies were reported of all responses to the exploratory follow-up questions on sources of need satisfaction.

Results

The results of the initial correlational analyses can be found in Table 1.

Stress-Related Growth

Stress-related growth and basic psychological need satisfaction. Initial correlational analyses indicated no statistically significant correlations between stress-related growth and autonomy, relatedness, competence, and total need satisfaction scores (see Table 1). A linear regression model with five predictors including injury severity (weeks out of sport), the number of weeks since the injury occurred, autonomy satisfaction, relatedness satisfaction, and competence satisfaction, produced a non-statistically significant model of $R^2 = .053$, $F(5, 87) = .965$, $p = .444$. The only predictor that approached a statistically significant influence on stress-related growth was the number of weeks since the injury occurred ($\beta = -.076$, $p = .059$), suggesting that the more time since the injury occurred, the less growth experienced was reported. A post-hoc power analysis revealed adequate power ($1 - \beta = .80$), indicating that the probability of a Type II error was low and that the sample size was large enough to compete this statistical analysis.

Stress-related growth and basic psychological need frustration. Similar to need satisfaction findings, initial correlations indicated no statistically significant relationships between stress-related growth and autonomy frustration, relatedness frustration, competence frustration, and total need frustration scores (see Table 1). A linear regression model with five predictors including injury severity (weeks out of sport), the number of weeks since the injury occurred, autonomy frustration, relatedness frustration, and competence frustration, produced a non-statistically significant model of $R^2 = .071$, $F(5, 87) = 1.327$, $p = .260$. The only predictor

Table 1

Means, Standard Deviations, and Pearson Correlation Matrix for Continuous Variables (N = 93)

Measures	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12
1. SRGS Total	48.69 (25.81)												
2. Autonomy Sat	2.92 (.91)	.096											
3. Autonomy Frus	2.79 (.76)	.024	-.385#										
4. Relatedness Sat	3.64 (.81)	.065	.654#	-.377#									
5. Relatedness Frus	2.21 (.79)	.154	-.533#	.382#	-.660#								
6. Competence Sat	2.69 (.95)	.041	.692#	-.608#	.652#	-.656#							
7. Competence Frus	3.32 (.98)	.116	-.552#	.608#	-.594#	.696#	-.791#						
8. Total Satisfaction	3.09 (.79)	.076	.890#	-.523#	.860#	-.697#	.895#	-.737#					
9. Total Frustration	2.77 (.72)	.119	-.585#	.772#	-.649#	.822#	-.818#	.928#	-.779#				
10. Injury Severity	23.97 (19.19)	.028	-.184	.129	-.012	.103	-.132	.120	-.129	.138			
11. Time Since Injury	117.75 (68.74)	-.202	-.098	.198	-.149	.084	-.113	.032	-.135	.116	.080		
12. Age at Injury	24.61 (5.68)	-.233*	-.006	-.174	.104	-.149	.156	-.190	.096	-.203	.148	-.083	
13. Current Age	26.78 (5.68)	-.295#	-.047	-.116	.059	-.106	.104	-.161	.044	-.153	.159	.138	.970#

Note. SRGS = Stress Related Growth Scale; Sat = satisfaction; Frus = frustration. *$p < .05$. #$p < .01$

with a statistically significant impact on stress-related growth was the number of weeks since the injury occurred (β = -.082, p = .045), indicating that the longer since the injury occurred, the less growth was reported. A post-hoc power analysis revealed close to satisfactory power (1 - β = .75), which approached the standard of .80, indicating that the sample size of 93 was adequate for completing this statistical analysis.

Stress-related growth and injury factors. Correlational analyses indicated no statistically significant correlations between stress-related growth and injury severity, and length of time since the injury occurred; however, the correlation between stress-related growth and time since the injury occurred approached statistical significance (p = .052). There were two statistically significant correlations between age at time of injury and growth (r = -.233, p = .025) and current age and growth (r = -.295, p = .004); the older the athlete was at injury onset, the less growth was reported and the older the athlete was at time of participation in this study, the less growth reported.

Basic Psychological Need Fulfillment

Exploratory analyses on perceived need fulfillment. When given definitions of basic psychological need fulfillment, 25% of respondents reported that only one of their needs was satisfied, 17% reported that two needs were satisfied, and 46% reported that all three needs had been satisfied in at least one aspect of life during the time of their injury (see Table 2 for specific sources). Conversely, 12% reported having no needs satisfied during their injury recovery. Of the athletes who reported at least one need satisfied (n = 82), the relatedness need (67%) was more frequently reported as satisfied, followed by competence (65%), then autonomy (62%).

Three independent samples t-tests were conducted in order to compare differences in stress-related growth scores in each of perceived competence, perceived autonomy, and

Table 2

Percentage of Perceived Basic Psychological Need Satisfaction Sources During Healing Process of Athletes who Indicated Need Satisfaction

	Sources of Perceived Need Satisfaction							
	Rehab	Sport	Work	School	Home	Personal Relationships	Non-sport hobby	Other
Relatedness (n = 62)	60%	76%	35%	21%	48%	69%	11%	2%
Competence (n = 60)	50%	23%	65%	30%	43%	60%	22%	3%
Autonomy (n = 58)	41%	17%	62%	38%	59%	55%	22%	0%

Note. Percent of respondents was calculated based on the proportion of participants that indicated the source contributed to their need satisfaction out of all participants who said that their need was satisfied.

perceived relatedness. The t-tests compared the stress-related growth scores of the groups of participants who reported that a specific need was satisfied to the groups who reported that that specific need was not satisfied. There were no statistically significant differences in the stress-related growth scores for the perceived competence group (M = 48.28, SD = 25.74) and no perceived competence group [M = 52.36, SD = 25.89; $t(87)$ = -.720, p = .473, Cohen's d = .006]. Similarly, there were no statistically significant differences in the stress-related growth scores for perceived autonomy group (M = 50.38, SD = 26.40) and no perceived autonomy group [M = 46.00, SD = 25.04; $t(88)$ = .777, p = .439, d = .006]. Finally, there were no significant differences in the stress-related growth scores for the group who perceived their relatedness need as satisfied (M = 50.60, SD = 25.85) and the group who did not perceive relatedness satisfaction [M = 48.60, SD = 25.42]; $t(86)$ = .347, p = .730, d = .001]. These results suggest that there were

no differences in reported stress-related growth scores regardless of the perceptions if one's basic psychological needs were met while injured.

Discussion

Results from the current study suggest that there are no statistically significant relationships between stress-related growth and basic psychological need satisfaction and frustration among adult athletes. Further, there was also no statistically significant relationship between stress-related growth and severity of injury. The first hypothesis of the current study predicted that participants with higher levels of recalled basic psychological need satisfaction while they were injured, would report more injury-related growth. The second hypothesis was that high need frustration would predict less stress-related growth after suffering an athletic injury; neither hypothesis was supported in the findings of this study. Statistical analyses, including correlational analyses and multiple regressions, revealed no statistically significant relationships between need satisfaction or need frustration with stress-related growth among the athletes in this study. The lack of relationship indicates that stress-related growth after injury was not predicted by need satisfaction nor frustration and there may be other factors that influenced the growth experienced by the participants in this study. The third hypothesis of this study, that a larger number of weeks away from sport participation due to injury would predict more growth, was not supported. There was no statistically significant relationship found between stress-related growth and time away from sport due to injury and the regression analysis revealed that severity of injury did not predict stress-related growth.

The current findings contradict the results of Wadey and colleagues (2015), who found that basic psychological need satisfaction in the rehabilitation setting was positively correlated with stress-related growth after athletic injury (Wadey et al., 2015). It is unclear why the results

were not replicated in the current study. First, it is important to point out the similarities between the two studies. The age range of the two samples were very similar. The athletes used in this study ranged from 19 to 52 years old, while Wadey and colleagues (2015) used a pool of athletes ranging from 18 to 59 years old. Additionally, there was consistency among the growth measured on the Stress-Related Growth Scale; the mean score for the current study was 48.7 and it was 48.9 for Wadey et al. (2015). However, Wadey and colleagues reported a larger sample of exclusively high-level athletes (state, national, and international level), so the differences in both size and composition of the population may account for the difference in the findings. However, a strength of the present study was the use of stratified random sampling to target a wide range of adult participants; however, it is unknown what sampling procedure beyond a convenience sample was used in the Wadey and colleagues study. The current study also limited inclusion to a more homogenous group of injuries, which is recommended in psychology of injury research (Brewer, 2012). Overall, the current study had somewhat similar methodology to Wadey et al. (2015), yet the results were not duplicated. Therefore, more research is needed in order to better understand the relationship between self-determination theory, namely basic psychological needs, and stress-related growth.

While the results differ from previous literature (Wadey et al., 2015), the current findings add to the literature by incorporating the full theoretical model of need fulfillment by assessing both need satisfaction and frustration (Chen et al., 2015; Ryan & Deci, 2000; Vansteenkiste & Ryan, 2013). Including need frustration in addition to need satisfaction in basic needs research is important because need frustration is not just the opposite of need satisfaction; frustration is an indication that there is something working against or preventing the opportunity for the need to be satisfied (Vansteenkiste & Ryan, 2013). Perhaps the results of the current study differed from

those of the previous study because in the current study, participants were asked about need satisfaction in not just the rehabilitation setting, but in life in general. Another major difference between the current study and the study completed by Wadey and colleagues (2015) was the scale used to measure need satisfaction. Wadey and colleagues (2015) used an adapted and validated version of the Basic Psychological Need Satisfaction Scale (Podlog et al., 2010) that assessed need satisfaction with only eight questions. Regardless of the addition of the current findings, there remains little information on the relationship between growth after athletic injury, so more research is needed given the conflicting results. More research exploring this topic is important in order to recognize factors that may help to increase the likeliness of the occurrence of growth after injury and give athletes who suffer injuries hope for positive outcomes.

To explain why time away from sport was not a predictor of SRG, it is possible that the athlete's perception of the severity of the injury (Carson & Polman, 2008) could be a better predictor of stress-related growth. An athlete's perception of their injury severity is likely more closely related to their emotional reaction to the injury than any objective measure of severity (Masten et al., 2014; Smith et al., 1993), such as time away from sport that was used in this study. For example, two athletes may both experience an injury that prevents them from participating in sport for four weeks, yet one may perceive the injury to be minor because it is the second time the athlete has had the injury. Whereas, the second athlete could perceive it to be very severe because there is fear of not being able to return to the same level. The differences in perceptions would make the objective severity of the injury less impactful on psychological outcomes. According to the transactional theory of emotions and coping (Lazarus & Folkman, 1987) and the injury response model (Udry, 1997), the degree to which an injury may affect an

athlete could be controlled by an athlete's own appraisal of their injury, which plays a large role in determining how an athlete responds to being injured (Carson & Polman, 2008; Lattimore, 2017). Therefore, individual injury appraisal may predict stress-related growth better than severity of injury. Future qualitative research should aim to explore athletes' own appraisal of their injuries.

It is also possible that the measurement used to assess stress-related growth influenced the results of the study. Prior researchers have found that recovering from a physical injury is often a different experience than other life stressors (Hefferon, 2012), and may also result in different types of growth (Roy-Davis et al., 2017). However, the Stress-Related Growth Scale (Park et al., 1996) is a survey meant to assess growth in the general population after experiencing a stressful event. Since injury, particularly athletic injury, is a unique experience, perhaps a sport-specific measure of growth is needed in order to more accurately assess sport-injury related growth. More specifically, the Stress-Related Growth Scale (Park et al., 1996) in its current form does not utilize subscales representing each of the five areas of growth previously identified in research (Tedeschi & Calhoun, 1996). Any growth experienced by the participants of this study may have been missed by the SRGS; although the potential errors in the scale do not account for the differences in findings between the present study and those found by Wadey and colleagues (2015). It is possible that basic psychological need satisfaction and frustration are not predictors of stress-related growth for athletes.

The exploratory analysis in the current study revealed more insights into potential sources of need satisfaction directly connected to sport. The two most common sources of relatedness satisfaction were sport and personal relationships, the top competence sources were personal relationships and work, and finally, the most common sources of autonomy were work and

home. This was the first known study that included a direct question to previously injured athletes about their perception of whether or not their basic psychological needs were satisfied while they were injured, and where the sources of their need satisfaction originated. Interestingly, the rehabilitation setting, which was the only setting explored in prior research linking SRG to SDT (Wadey et al., 2015), was not the most common area in which any of the needs were satisfied. In addition to identifying where needs were satisfied, it was also revealed where needs were not satisfied for athletes while they were injured. Of the entire sample of participants, more than half of the athletes reportedly did not have their relatedness or competence need satisfied in their rehabilitation setting, and almost three-quarters of athletes did not have their autonomy need satisfied in rehabilitation. The low level of autonomy need satisfied in rehabilitation settings is consistent with Wadey et al. (2015) who theorized this may be due to the participants' trust in their doctors and trainers, which does not require a high level of autonomy (Wadey et al., 2015). It is unclear why competence and relatedness were not satisfied in the rehabilitation setting by the majority of the sample in this study, but was in Wadey et al.'s study; it could be a matter of differences in healthcare or access to resources. A question regarding rehabilitation resources, including if the participants even completed formal rehabilitation, was not included in this study but would be valuable to assess in future research. The previous study completed on this topic included a sample consisting of elite-level athletes (Wadey et al., 2015), who may have more access to health care, rehabilitation, and other areas of support necessary for recovering from injury. Recruitment for participants of this study was primarily targeted towards adult competitive, recreational athletes who did not compete at an equally elite level; however, the athletes' level of competition was not assessed in this study, so there is a limitation to not knowing the specific levels that make up this sample of athletes nor

their access to quality healthcare. It is also possible that an adult population may have to deal with consequences of injury such as missing work, financial burden, or healthcare burdens. Future research on this topic should assess for both level of competition and healthcare support resources while injured. Additionally, several athletes did report satisfaction of their relatedness and competence needs in their rehabilitation setting. Future researchers may want to explore the ways in which needs were satisfied in order to inform rehabilitation specialists.

Interestingly, of the total sample of participants, sport was the largest source of relatedness for the current participants (approximately 50%) but was less frequent for competence (15% of all participants) and autonomy (11% of all participants). This finding illuminates that competence and autonomy fulfillment are both potentially missing from sport while athletes are injured. The only psychological need satisfied in sport for a large number of participants was relatedness, supporting findings that autonomy and competence needs are most often satisfied in areas unrelated to sport for athletes with injuries (Podlog et al., 2013). As practitioners in sport psychology, it would be important to further explore what prevented need satisfaction in these areas and what could promote it in the future. It is also important to build an understanding of how to satisfy the needs of an injured athlete in their sport setting, whether that may be satisfying competence during injury by practicing imagery or involving the athlete in playmaking and coaching decisions. Satisfying autonomy for injured athletes may be accomplished by allowing the athletes to choose the role they will play for the team while they are unable to participate or by giving choice in the way athletes will continue to contribute to the team. There is also a possibility that the injured athletes in this study did not report need satisfaction in their sport settings while they were injured because they were not present in their sport setting due to their injury. Previous research has suggested that removing an athlete from

their sport completely while injured contributes to loss of identity, feelings of isolation, and a decrease in fitness and overall skills related to the sport (Green & Weinberg, 2001). It appears crucial to not only allow athletes to remain present in their sport setting while injured, but also to find a way to satisfy their basic psychological needs while doing so to maintain well-being. Future research could be helpful in developing interventions specifically targeted to increase need satisfaction in sport-related settings that may eventually promote positive outcomes should an athlete suffer an injury.

Personal relationships were a common source of satisfaction for all three basic needs, 46% of participants for relatedness, 39% for competence, and 34% for autonomy reported their needs satisfied through personal relationships. The proportion of needs satisfied through personal relationships is an interesting finding, one that could be further explored in future research. In hindsight, it is possible that the personal relationships identified in this study as fulfilling needs were sport-related, such as relationships with teammates or coaches, future research should distinguish between sport-related and non-sport personal relationships. In the present study, the source of *sport* was meant to refer to all aspects of the sporting experience, including relationships within sport, time spent in the sport setting, and sport performance. It is possible that the participants of this study interpreted *sport* as only involving performance; future researchers should aim to define sport more clearly, or even by qualitatively exploring how multiple aspects of sport can influence need satisfaction and growth during and after injury.

An unexpected finding from this study was the negative correlation between stress-related growth and age, indicating that the older a participant was, both at the time of their injury and at the time of their participation in the current study, the less growth they reportedly experienced as a result of their injury. One possible explanation for this relationship is that older

athletes perceived less growth because they identified with their athlete role less, so the injury had a lesser impact on them to begin with. As discovered in previous research, athletic identity has an inverse relationship with career maturity in high-level college athletes (Murphy, Petitpas, & Brewer, 1996); this may also be the case for competitive athletes of all ages. The participants' athletic identity could also impact their appraisal of the injury, which would then determine their emotional response and eventually potentially influencing whether or not the athletes experienced growth (Lazarus & Folkman, 1987; Udry, 1997). Older athletes also may have experienced more previous injuries and it is possible that they only grew after their first major injury. There may be differences in motivation to participate in sport among athletes of various levels. Adult athletes may have other roles, such as a career, that they may identify with more strongly; these athletes may experience less growth after injury because the impact of the injury in the first place was not as large.

Another surprising finding from this study was the inverse correlation between time since injury and stress-related growth. Since the participants' injuries could have occurred up to 5 years prior to this study (M = 117.75 weeks, SD = 68.74 weeks), it may have been difficult for participants to recall growth that specifically came from a past injury. The participants answered the questions about one injury in particular, even though they potentially could have had multiple injuries within the five-year period. It may have been difficult for athletes to refer to growth resulting from one particular injury if they had suffered many, therefore experiencing compounding effects from each injury. It is also possible that because the growth could have happened far enough in the past, the changes that occurred as a result of the injury have become normalized or forgotten by the athlete. It is also likely that participants whose injury occurred a long time ago have had other experiences that have impacted them more recently than their

injury. For example, if someone's injury occurred almost five years ago, it is likely that they have experienced other stressful events in any area of life, such as losing family members, health issues, or accidents, that may have made a larger effect on the athlete, and therefore making the growth from the injury seem less significant.

Although basic psychological need satisfaction or frustration did not predict stress-related growth after injury, there are other possible sources that may account for the growth experienced by the participants of this study. The participants experienced a wide range of injuries; it is possible that those who did not experience growth did not experience negative psychological consequences due to their injury, as every individual copes differently to athletic injury (Shapiro, et al., 2017; Wiese-Bjornstal et al., 1998). It is also feasible that those who did not experience growth did not have the resources, support, or positive outlook that prior research has suggested is necessary in order for growth to occur (Khanjani et al., 2017). Additionally, it is possible that the athletes who did not experience growth had a more negative mood state profile (Wiese-Bjornstal et al., 1998) or were low in certain personality traits, such as hardiness (Levine et al., 2009) or resilience (Bensimon, 2012). Perhaps a better determinant of growth involves an interaction between personality traits, athletic identity, and basic psychological need satisfaction and frustration.

Although these findings add to the limited data regarding the connection between stress-related growth and basic psychological needs, there were limitations to the current study. Since this study was based on self-report surveys that asked the participants to refer back to a time when they were injured, the recall required to answer the questions may have been inaccurate. One method of collecting data that may result in more insightful findings would be to longitudinally assess the variables throughout the injury recovery. Lastly, time since injury was a

potential limitation. Both the absence of no minimum amount of time elapsed since the injury occurred in order to participate and the number of weeks since the injury occurred varied widely, ranging from 5 weeks to 260 weeks; it was possible that the participants were yet to realize that they experienced growth as a result of that injury or that some failed to recall the growth.

Summary

Even though the three hypotheses of this study were not supported, a few findings regarding stress-related growth, need satisfaction and frustration, and severity of injury, were noteworthy. The possible negative correlation between stress-related growth and time since injury (r = -.202, p = .052) indicates that perhaps five years is too long to recall growth from an injury and that there is a need for research regarding the time frame in which growth can be identified and assessed. The strong, negative correlation found between current age and stress-related growth indicates that there was more growth reported by younger athletes. In future studies, researchers should explore the relationship between athletic identity and stress-related growth after injury, as well as the impact of an injury on athletes with different levels of athletic identity. More qualitative research incorporating athletes' perceptions of their injuries, particularly regarding severity of injury, is necessary in order to better understand influencers of growth. Basic psychological need fulfillment may be a predictor of stress-related growth for those who are high in athletic identity, but maybe only for those who are not resilient. Future research on SRG and SDT could include a measure of athletic identity in the regression analysis to explore this possibility.

Sources of need satisfaction during injury still need to be researched more thoroughly, specifically need satisfaction and frustration in sport and how athletes experience competence and autonomy in sport while injured. Even though the main hypothesis of this study that more

need satisfaction would result in more growth after injury was not supported, information regarding the sources of the need satisfaction that did occur has been added to the literature. Many participants of this study indicated low need satisfaction in sport-related settings and higher need satisfaction deriving from personal relationships. This information regarding the value of sport-related settings and personal relationships is helpful in guiding the direction of future research involving need satisfaction for injured athletes.

In summary, there were no statistically significant relationships between stress-related growth and basic psychological need satisfaction and frustration found in the previously injured adult athletes in the current study. It was also observed that the many participants in this study did not perceive their basic psychological needs to be satisfied in sport or rehabilitation settings while they were injured, but some found need satisfaction from personal relationships or other areas. These findings indicate that there may be other factors unrelated to psychological need fulfillment that may explain the occurrence of stress-related growth. Future researchers should explore athletic identity or other aspects of injury appraisal that may influence growth, in hopes of finding a way to influence growth in injured athletes and offset the many negative consequences of injury.

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Appendix A

Manuscript Guidelines

When preparing manuscripts for submission in *The Sport Psychologist*, authors should follow the guidelines in the *Publication Manual of the American Psychological Association* (6th edition; www.apa.org). Manuscripts must be submitted in English. All manuscripts must be preceded by an abstract of no more than 150 words. If footnotes are used, they should be as few as possible and should not exceed six lines each. Figures should be created in Excel or saved as TIFF or JPEG files. All tables, figure captions, and footnotes must be grouped together on pages separate from the body of the text. Reference citations in the text must be accurate concerning dates of publication and spelling of author names, and they must cross-check with those in the reference list. Manuscripts will be summarily rejected if they do not follow the APA guidelines. Please activate continuous line numbering throughout the manuscript.
Manuscripts submitted will be judged primarily on their substantive content, but writing style, structure, and length are very important considerations. Poor presentation is sufficient reason for the rejection of a manuscript. When first received, manuscripts will be evaluated by the editor in terms of their contribution-to-length ratio. Thus, manuscripts should be written as simply and concisely as possible. However, we recognize that in rare circumstances, papers intended to make very extensive contributions may require additional space. Prior to submitting a manuscript, authors should consider the contribution-to-length ratio and ask themselves, "Is the paper long enough to cover the subject while concise enough to maintain the reader's interest?" (This paragraph is based on the Information for Contributors of the Academy of Management Review.)

Manuscripts must not be submitted to another journal while they are under review by *The Sport Psychologist* nor should they have been previously published. Manuscripts are read by two reviewers, with the review process taking 8–12 weeks. Manuscripts will be evaluated in terms of topical relevance, theoretical and methodological adequacy, and clarity of explanation and analysis. Authors should be prepared to provide the data and/or research instrument(s) on which the manuscript is based for examination if requested by the editor. Comments from reviewers concerning manuscripts along with the editorial decision are made available to authors. When you submit, please make it clear in your cover letter if you wish to have your manuscript reviewed under Applied Research or Professional Practice. Please note that a blind review process is used to evaluate manuscripts. As such, any clues to the author's identity should be eliminated from the manuscript. The first page of the manuscript must not include author names or affiliations, but it should include the title of the paper and the date of submission.

Authors are advised to check carefully the typing of the final copy and to retain a copy of the manuscript to guard against loss. There are no page charges to contributors.
Brief reports are limited to 7 pages. Importantly, both Applied Research and Professional Practice manuscripts should not exceed 25 pages, but for multistudy or in-depth qualitative material of extended scale and scope, pages may run to a maximum of 35 on the initial submission. The additional page allowance for longer manuscripts is at the editor's discretion. Manuscripts will be judged according to their applied focus, contributions to knowledge, presentation of information, appropriateness of the discussion, interpretation of ideas, and clarity of writing. In addition, Applied Research articles will be judged on their methodology/design and data analysis. Authors are expected to have their raw data and descriptive statistics available throughout the editorial review process and are responsible for providing elaboration upon request.

Appendix B
Western Washington University Internal Review Board Notification

WESTERN WASHINGTON UNIVERSITY
Office of Research and Sponsored Programs

MEMORANDUM

To: Samantha MacDonald

FROM: Stephanie Richey, Research Compliance Officer

DATE: 4/8/2019

SUBJECT: Institutional Review Board– Exemption Research Approval

Thank you for submitting a research protocol regarding your human subject research EX19-095 "Exploring the relationship between self-determination theory basic psychological needs and stress-related growth in athletic injuries" for review by the Institutional Review Board (IRB).

Approval: The IRB has reviewed the materials you submitted and found the project described falls into Category #2. Although the research qualifies for exempt status under 45 CFR §46, the investigators still have a responsibility to protect the rights and welfare of their subjects, and are expected to conduct their research in accordance with the ethical principles of Justice, Beneficence, and Respect for Persons, as described in the Belmont Report, as well as with state and local institutional policy. All students and investigators collecting or analyzing data must be qualified and appropriately trained in research methods and responsible conduct of research.

Determination Period: An exempt determination is valid indefinitely, as long as the nature of the research activity remains the same. If the involvement of human participants changes over the course of the study in a way that would increase risks, please submit a modification form.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems that may increase the risk to the human subjects or change the category of review, notify the Research Compliance Officer promptly. Any complaints from subjects pertaining to the risk and benefits of the research must be reported to the Research Compliance Officer.

If you have any questions, feel free to email me at compliance@wwu.edu.

REVIEWER'S SIGNATURE:

Appendix C

Inclusion Criteria

1. Are you at least 18 years old?
    a. Yes
    b. No (automatically sent to thank you page)
2. Have you ever suffered a serious athletic injury to a lower extremity (toe, foot, ankle, calf/shin, knee, quad/hamstring, hip) that resulted in at least 4 weeks of being unable to practice or compete in your primary sport?
    a. Yes
    b. No (automatically sent to thank you page)
3. Did your serious lower extremity injury (referred to in the previous question) occur within the past 5 years? (If you have had more than one in the past 5 years, please answer all remaining questions related to the most severe lower extremity injury during that time)
    a. Yes
    b. No (automatically sent to thank you page)
4. Did you participate in a sport organized by a national or international governing body (e.g., U.S. Adult Soccer, USA Ultimate, USA Rugby, USTA tennis leagues, etc.) at the time of this lower extremity injury?
    a. Yes
    b. No (automatically sent to thank you page)
5. Were you able to return to competing in your primary sport after you healed from this injury?
    a. Yes
    b. No (automatically sent to thank you page)

Appendix D

Informed Consent

Purpose and Benefit:

The purpose of this research study is to better understand athletes' motivation to recover from injury as well as to gather information on their experience of injury. The results will hopefully increase our understanding and awareness of athletes' experiences with injury in order to inform programs geared to improve athletes' experiences and enhance their responses to injury.

REGARDING MY PARTICIPATION IN THIS STUDY, I UNDERSTAND THAT:

1) You must be 18 years of age or older to participate in this study.
2) To participate, you must be a current competitive athlete (offseason is okay).
3) This research study will involve completion of questionnaires. Two example questions from the questionnaires are: "I felt confident that I could do things well," and "I learned to be a more optimistic person." Further, you will be asked for general personal information such as your age, what sport you participate in, and details of your injury.
4) Your participation and information will remain **confidential**.
5) Your participation will involve approximately 10 minutes.
6) Although there are no direct personal benefits from completing this study, your participation can further knowledge about athletes' responses to sport injury.
7) While there are no expected risks to participating, some questions may cause you some discomfort during recall of events.
8) Your participation is voluntary and you may choose to withdraw from participating at any time without penalty or loss of benefits.

9) This research is being conducted by Samantha MacDonald, a Master's student at Western Washington University, under the supervision of Dr. Linda Keeler. Any questions that you have about this study or your participation may be directed to Samantha at macdons5@wwu.edu, or the Western Washington University Office of Research and Sponsored Programs (RSP) at compliance@wwu.edu or (360) 650-2146.

10) If you want a copy of this consent form, you can print this page or contact the researcher. at: macdons5@wwu.edu

The Human Subjects Review Committee (HSRC) at Western Washington University has approved this study. If you have any questions about your participation or your rights as a research participant, you can contact the Western Washington University Office of Research and Sponsored Programs (RSP) at compliance@wwu.edu (360) 650- 2146,. If during or after participation in this study you suffer from any adverse effects as a result of participation, please notify the researcher directing the study or the WWU HSRC.

****

By clicking on this box to continue the survey, you indicate that you have read the above description, you are 18 years of age or older and you agree to participate in this study.

Appendix E

The Basic Psychological Needs and Frustrations Scale

Below, we are going to ask you about your actual experiences while you were unable to participate in sport due to a serious lower limb injury that occurred within the last 5 years. If you have been injured more than once in the past 5 years, choose the injury you consider to be the *most severe* within this time frame and answer the remaining questions with that injury in mind. Please read each of the following items carefully. You can choose from 1 to 5 to indicate the degree to which the statement was true for you in any part of your life (e.g., work, school, hobby, sport, relationships, etc.) during the time when your injury was healing.

1	2	3	4	5
Not true at all				Completely true

1. I felt a sense of choice and freedom in the things I undertook
2. Most of the things I did felt like “I have to”
3. I felt that the people I cared about also cared about me
4. I felt excluded from the group I wanted to belong to
5. I felt confident that I could do things well
6. I had serious doubts about whether I could do things well
7. I felt that my decisions reflected what I really wanted
8. I felt forced to do many things I wouldn’t chose to do
9. I felt connected with people who cared for me and for whom I cared for
10. I felt that people who were important to me were cold and distant toward me
11. I felt capable at what I did

12. I felt disappointed with many of my performances

13. I felt my choices expressed who I really am

14. I felt pressured to do many things

15. I felt close and connected with other people who were important to me

16. I had the impression that people I spent time with disliked me

17. I felt competent to achieve my goals

18. I felt insecure about my abilities

19. I felt I was doing what really interested me

20. My daily activities felt like a chain of obligations

21. I experienced a warm feeling with the people I spent time with

22. I felt the relationships I had were just superficial

23. I felt I could successfully complete difficult tasks

24. I felt like a failure because of the mistakes I made

Appendix F

The Stress-Related Growth Scale

Rate how much you experienced each item below as a result of your serious sport-related injury that occurred within the past five years. If you have been injured more than once in the past 5 years, choose the lower limb injury you consider to be the *most severe* and answer the remaining questions of this questionnaire with that injury in mind.

0	1	2
Not at all	Somewhat	A great deal

1. I developed new relationships with helpful others
2. I gained new knowledge about the world
3. I learned that I was stronger than I thought I was
4. I became more accepting of others
5. I realized I have a lot to offer other people
6. I learned to respect others' feelings and beliefs
7. I learned to be nicer to others
8. I rethought how I want to live my life
9. I learned that I want to accomplish more in life
10. My life now has more meaning and satisfaction
11. I learned to look at things in a more positive way
12. I learned better ways to express my feelings
13. I learned that there is a reason for everything
14. I developed/increased my faith in God

15. I learned not to let hassles bother me the way they used to

16. I learned to take more responsibility for what I do

17. I learned to live for today, because you never know what will happen tomorrow

18. I don't take most things for granted anymore

19. I developed/increased my trust in God

20. I feel freer to make my own decisions

21. I learned that I have someone of value to teach others about life

22. I understand better how God allows things to happen

23. I learned to appreciate the strength of others who have had a difficult life

24. I learned not to "freak out" when a bad thing happens

25. I learned to think more about the consequences of my actions

26. I learned to get less angry about things

27. I learned to be a more optimistic person

28. I learned to approach life more calmly

29. I learned to be myself and not try to be what others want me to be

30. I learned to accept myself as less than perfect

31. I learned to take life more seriously

32. I learned to work through problems and not just give up

33. I learned to find more meaning in life

34. I changed my life goals for the better

35. I learned how to reach out and help others

36. I learned to be a more confident person

37. I learned not to take my physical health for granted

38. I learned to listen more carefully when others talk to me

39. I learned to be more open to new information and ideas

40. I now better understand why, years ago, my parents said/did certain things

41. I learned to communicate more honestly with others

42. I learned to deal better with uncertainty

43. I learned that I want to have some impact on the world

44. I leaned that it's okay to ask others for help

45. I learned that most of what used to upset me were little things that aren't worth getting upset about

46. I learned to stand up for my personal rights

47. A prior relationship with another person became more meaningful

48. I became better able to view my parents as people, and not just parents

49. I learned that there are more people who care about me than I thought

50. I developed a stronger sense of community, of belonging, that I am part of a larger group

Appendix G

Follow-up Questions

Psychologists define "relatedness" as the feeling of a sense of belonging in a group and feeling connected with others.

1. During the time of your injury, did you feel like you had a sense of belonging or felt a sense of relatedness in any area of your life?
    a. Yes
    b. No
    c. Unsure/cannot recall
2. If yes to the previous question, in which areas do you recall feeling this sense of belonging and relatedness during the time of your injury (check all that apply)?
    a. Rehabilitation settings (PT clinic, athletic trainer, etc)
    b. Sport
    c. Work
    d. School
    e. Home
    f. Personal Relationships
    g. Non-sport hobby
    h. Other: _____

Psychologists define "competence" as the degree to which you feel confident in your abilities to be successful at something.

1. While you were seriously injured, did you feel competent in any area of your life?

a. Yes

b. No

c. Unsure/cannot recall

2. If yes to the previous question, which areas do you recall feeling this sense of competence during the time of your injury (check all that apply)?

    a. Rehabilitation settings (PT clinic, athletic trainer, etc)

    b. Sport

    c. Work

    d. School

    e. Home

    f. Personal Relationships

    g. Non-sport hobby

    h. Other: _____

Psychologists define "autonomy" as the degree to which you feel you have choices, are in control over your situation, or experience a sense of independence.

1. While you were seriously injured, did you feel like you had autonomy in any area of your life?

    a. Yes

    b. No

    c. Unsure/cannot recall

2. If yes, which areas do you recall feeling this sense of autonomy during the time of your injury (check all that apply)?

    a. Rehabilitation settings (PT clinic, athletic trainer, etc)

b. Sport

c. Work

d. School

e. Home

f. Personal Relationships

g. Non-sport hobby

h. Other: _____

Appendix H

Demographic Questions

1. How long ago did your lower extremity injury occur? Note: If you have been injured more than once in the past 5 years, choose the injury you consider to be the most severe and answer the remaining questions of this questionnaire with that injury in mind.

   _____ years

   _____ months

   _____ weeks

2. What age were you when the injury happened?

   _____ years

3. What body part was injured? Check the one that applies best to your injury:
   a. Toe
   b. Foot
   c. Ankle
   d. Calf/shin
   e. Knee
   f. Quad/hamstring
   g. Hip
   h. Other/Not Sure/Multiple (please explain): _____

4. What was the injury to the above body part? Check the one that best describes your injury.
   a. soft tissue (ligament/tendon) damage
   b. broken/fractured bone(s)

c. dislocation

d. other/not sure/multiple (please explain): _____

5. After you were injured, how long was it before you were cleared to play?

   _____ years _____ months _____ weeks

6. Which sport were you participating in when your injury occurred?

   a. Basketball

   b. Baseball/Softball

   c. Boxing

   d. Competitive Cheer or Dance

   e. Cross Country / Distance Running

   f. Equestrian

   g. Football

   h. Golf

   i. Gymnastics

   j. Ice Hockey/Field Hockey

   k. Lacrosse

   l. Martial Arts/MMA

   m. Rugby

   n. Rowing/Kayaking/Paddling

   o. Swimming and Diving

   p. Skiing/Snowboarding

   q. Soccer

   r. Tennis/Racquet sports

s. Track and Field

t. Ultimate Frisbee

u. Volleyball/Beach Volleyball

v. Water Polo

w. Wrestling

x. Other (please specify) _____

7. What is your age in years? _____

8. What was your sex at birth?

    a. Female

    b. Male

    c. Intersex

    d. Other/prefer not to respond

9. Does your current gender identity differ from your birth sex?

    a. Yes

    b. No

    c. Unsure/prefer not to respond

10. What is your ethnicity? (select all that apply)

    a. American Indian or Alaska Native

    b. Asian (including Indian subcontinent and Philippines)

    c. Black or African American (including Africa and Caribbean)

    d. Hispanic or Latino/Latina/Latinx (including Spain)

    e. Native Hawaiian

    f. Other Pacific Islander

g. White (including Middle Eastern)

h. Other (please specify)

i. Prefer not to respond

Appendix I

Contact Email

Hello,

My name is Sam MacDonald and I am a graduate student at Western Washington University in the Sport and Exercise Psychology Master's degree program. I am conducting a study exploring the emotional effects that suffering an injury may have on athletes. I would truly appreciate if you would forward this email, or simply the link included below, to any competitive athletes you know who have suffered a **lower-extremity injury** in the **past 5 years** in order for them to participate. Participation takes around 10 minutes and would involve answering some questions about their experiences while injured and any potential growth since their injury. The purpose of my study is to learn more about athletes' experiences while injured in order to potentially inform programs geared to improving athletes' experiences after injury.

I encourage you to also forward this email to anyone else who may know adult athletes interested in being part of my study. Participation in my study is voluntary and all of the athletes' identifying information will remain confidential. Anyone who completes the survey will have the option to enter their email and phone number in order to enter a **drawing for one of several $25 Amazon gift cards.**

[link to survey here]

You may contact me if you are interested in the results of my study. Please let me know if you have any further questions or comments. I appreciate your time.

Sincerely,

Samantha MacDonald

Macdons5@wwu.edu