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The Effects of an Imagery Intervention on Self-Efficacy during Athletic Injury Rehabilitation

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By

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Abstract

The purpose of the present study was to explore the effects of a multiple script imagery intervention on athletes' task and coping self-efficacy during injury rehabilitation. A multiple baseline design was used to assess for changes in rehabilitation self-efficacy over time. After completing a baseline phase, five adult (M_{age} = 29.4; SD = 9.6), competitive athletes engaged in a single guided imagery session with the lead researcher. Afterwards, participants were given four imagery audio recordings pertaining to healing, rehabilitation process, motivational, and pain management, and were instructed to listen to them 4 times per week for a range of approximately 2 to 4 weeks with autonomy in choice of which recording they used. Through visual analysis of trendline data, one participant experienced an increase in task and coping self-efficacy during the treatment phase, three participants experienced stable task and coping self-efficacy during the baseline and treatment phases, and one participant experienced a decrease in task and coping self-efficacy during the treatment phase. Athletes chose healing imagery most often during their rehabilitation phase. Qualitative reports indicated that participants felt practicing imagery helped them view their injury and rehabilitation process more positively and increased their hope and confidence for a full return to sport. High baseline task and coping efficacy could indicate the imagery helped participants retain their high levels of rehabilitation efficacy throughout their treatment as it is a factor that normally declines over the course of treatment in athletes.

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Literature Review

Sport-related injuries are extremely common and are often accompanied by complex physical and psychological side effects that can be detrimental to an athlete's well-being (Von Rosen, Kottorp, et al., 2018). Cognitive appraisals of said injuries, which are influenced by an array of personal and situational factors, play a key role in determining an athlete's emotional and behavioral responses to sustaining an injury, which may consequently shape recovery outcomes (Wiese-Bjornstal et al., 1998). Teaching athletes mental skills to use during injury rehabilitation may be an effective way to influence their cognitive appraisal of their injury (Brewer, 2010), which can have a positive effect on physical and psychological aspects of injury outcomes (e.g., Johnson, 2000; Maddison et al., 2012; Ross & Berger, 1996). Imagery is a mental skill athletes often use during training and competition; however, some researchers have also discovered its value during injury rehabilitation (e.g., Cupal & Brewer, 2001; Driediger et al., 2006). Researchers have found that using imagery during rehabilitation can reduce perceptions of pain, stress, and anxiety (Cupal & Brewer, 2001; Hoyek et al., 2014; Maddison et al., 2012). Imagery can also improve physical outcomes such as ligament laxity, muscular endurance, strength, and range of motion (Christakou et al., 2007; Cupal & Brewer, 2001; Hoyek et al., 2014; Maddison et al., 2012). Using imagery has also been linked to increased self-efficacy (Milne et al., 2005; Wesch et al., 2016), which refers to one's beliefs in their ability to execute a specific task in a given environment (Bandura, 1977).

Self-efficacy, or a person's task-specific self-confidence, plays a fundamental role in determining volitional human behavior by influencing the goals people set for themselves, how much effort they expend, how long they persevere in the face of challenges, and their resilience to failures (Bandura, 1977, 1994). Self-efficacy may also have a positive effect on injury rehabilitation. Self-efficacy has been positively correlated with enhanced treatment adherence and rehabilitation outcomes (Fortinsky et al., 2002; Slovinec D'Angelo et al., 2014) as well as reduced perceptions of pain and stress in a variety of populations ranging from elderly hospital patients to competitive athletes (Guo et al., 2019; Somers et al., 2012). This literature review includes an overview of sport-related injury prevalence, models related to cognitive appraisals of injury, psychological and behavioral aspects of the injury response, a summary of current research regarding the effects of imagery use in the medical and athletic realms, the influence of self-efficacy on various aspects of injury rehabilitation, and finally a summary of current research findings pertaining to the relationship between imagery and self-efficacy as related to sport performance and injury.

Sport and Recreation Injury Prevalence

From 2011-2014, an average of 8.6 million sports-and recreation-related injury episodes were reported per year, with an age-adjusted rate of 34.1 per 1,000 population (Sheu et al., 2016). About one-half of these injuries required treatment in a doctor's office or health clinic, 37% were severe enough to require emergency room treatment, and 3% resulted in hospitalization (Sheu et al., 2016). Due to the high level of participation in youth sports, sport related injuries are currently the primary cause of injury in young people (Goldberg et al., 2007). Additionally, severe injuries, defined as any injury resulting in 21 days or more lost of sport participation, comprised 14.9% of all high school sport injuries (Darrow et al., 2009). Of these severe injuries, 56.8% resulted in medical disqualification of an entire season and 28.3% required surgery (Darrow et al., 2009). Moreover, a longitudinal study of elite adolescent Swedish high school athletes revealed that one-year injury prevalence to be 91.6%, with an average of 30.8% of athletes reporting an injury each week, and 22.2% of injuries required at least two months of absence from normal sport training (Von Rosen, Heijne, et al., 2018). In addition to the physical consequences of sustaining an injury, athletes may experience negative psychological consequences such as a loss of identity, frustration, anger, feelings of loneliness, self-blame, or self-criticism (Von Rosen, Kottorp, et al., 2018). Athletes may also experience sleep disturbance, trouble focusing in school, or other changes in their daily routines (Von Rosen, Kottorp, et al., 2018). As sport injuries remain commonplace, research is needed to examine supplemental psychological treatments for sport and recreation-related injuries and their implications on physical and psychological functioning. Before conducting research on this topic, it is critical to consider the psychological theories of sport related injuries and use them to guide research in an ethical and purposeful direction.

Stress Response Models for Athletic Injury

The integrated model of response to sport injury and rehabilitation suggests that a sport injury is a stressor requiring an athlete's cognitive appraisal and that one's cognitive appraisal is influenced by interactions between personal and situational factors (Wiese-Bjornstal et al., 1998). An athlete's *cognitive* appraisal of an injury includes their perception of the impact of the injury, beliefs and attributions about themselves and the cause of the injury, perceived ability to cope with the outcome, and feelings of loss or relief (Wiese-Bjornstal et al., 1998). Personal factors that can influence one's cognitive appraisal of injury include the history and severity of the injury, psychological characteristics such as athletic identity and personality, demographic variables like age and socioeconomic status, and physical factors such as health status (Wiese-Bjornstal et al., 1998). Situational factors that may influence one's cognitive appraisal of injury may include sport type or playing status, social influences, and environmental factors such as the rehabilitation enviornment or accessibility to healthcare (Wiese-Bjornstal et al., 1998).

According to the model, the way an athlete appraises their injury influences their emotional responses, which will likely impact behavioral responses and may cycle back to influence cognitive appraisals (Wiese-Bjornstal et al., 1998). For example, when two athletes experience the same injury, their responses will likely differ based on each individual's thoughts and perceptions about the injury, which is influenced by factors like injury history, athletic identity, and age (Wiese-Bjornstal et al., 1998). Athlete "A" may have experienced the same injury in the past and found the rehabilitation process smooth and timely, which would likely result in a facilitative cognitive response, such as "I have done this before and I can do it again." Consequently, thoughts like this could lead to positive emotional responses such as hopefulness or optimism, which would then result in athlete "A" being proactive about seeking out physical therapy and doing at-home exercises. In contrast, if athlete "B" is experiencing their first injury ever, they could likely appraise the injury as a major stressor and therefore have negative emotional and subsequent behavioral responses such as fear, depression, or shame, which could then result in avoidance of seeking treatment. Given the complex psychological response to injury, athletes will likely benefit from injury rehabilitation that incorporates mental skills interventions in addition to standard physical therapy (Brewer, 2010).

Another multi-faceted theory related to sport injury, the biopsychosocial model of sport injury rehabilitation, attempts to explain how psychological factors can influence rehabilitation outcomes both directly and indirectly (Brewer et al., 2002). According to Brewer and colleagues (2002), factors such as personality, cognition, affect, and behavior can have direct effects on aspects of healing such as pain and rate of recovery (Brewer et al., 2002). For example, an athlete who prides themself on being tough (personality factor) may experience a greater quality of life during injury (rehabilitation outcome), potentially due to lower levels of percieved pain.

Psychological factors can also influence recovery indirectly through biologcal, social/contextual, and intermediate biopsychological factors (Brewer et al., 2002). For example, an athlete with a low pain tolerance (personality factor) may find the rehabilitation environment stressful (social/contextual factor) and therefore have decreased treatment satisfaction (rehabilitation outcome). In sum, the aforementioned models illustrate the complex interactions between the factors that can influence injury rehabilitation and suggest the importance of using a multidisciplinary approach to address thoughts and beliefs in addition to treating the injury itself.

Multimodal Mental Skill Interventions and Athletic Injury

Researchers employing multimodal mental skill interventions examine the effects of implementing multiple psychological skills over the course of a single study. Research that compared the efficacy of teaching multiple mental skill interventions during athletic injury rehabilitation outcomes has produced mixed results. Shapiro (2009) researched the effects of an individualized psychological skills intervention on injured athletes. In this study, six participants were taught four mental skills (goal setting, imagery, self-talk management, and relaxation) over the course of eight weeks, yet they had no changes in self-efficacy, exercise adherence, attitude, or speed of recovery over the course of the study. Subsequently, Shapiro (2009) advocated for exploration of mental rehabilitation programs to focus on less than four skills as participants may feel overwhelmed and unable to successfully incorporate that many skills into their treatment. In a similar multimodal study on injured athletes, Johnson (2000) explored the effectiveness of short-term psychological interventions in a group of competitive men and women who sustained long-term injuries. The experimental group ($n = 14$) attended three different training sessions addressing stress management and cognitive control, relaxation and guided imagery, and goal setting skills, while the control group ($n = 44$) did not receive any additional treatment. The intervention had an elevating effect on mood at the midpoint and at the end of rehabilitation compared to the control group. Additionally, the relaxation and guided imagery intervention was the only technique that showed a positive relationship with participants' readiness to return to sport (Johnson, 2000). Using a similar intervention design, Ross and Berger (1996) studied the effects of stress inoculation training on pain, anxiety, and physical functioning during rehabilitation in a group of 60 male athletes who underwent arthroscopic knee surgery. Participants assigned to the experimental group received two 60-minute stress inoculation training sessions surrounding conceptualization of cognitive and behavioral responses to surgery and skill acquisition including deep breathing, imagery, and self-talk management. Researchers found the mean number of days to recovery was less for the treatment group compared to the control group. Additionally, state anxiety and pain decreased more rapidly and were lower overall in the treatment group compared to the control group (Ross & Berger, 1996). Altogether, these multimodal intervention studies show some evidence for positive effects on recovery time, pain, anxiety, and readiness to return to sport; however, researchers were unable to clearly distinguish which mental skills were most beneficial due to the multimodal nature of the intervention (Johnson, 2000; Ross & Berger, 1996; Shapiro, 2009). In sum, additional research utilizing a single psychological skill is needed within the context of athletic injury to discern clear cause and effect and to generalize these results to larger groups. Although there are many mental skills that can affect an athlete's psychological state during an injury, the focus of this literature review is on imagery because it has been demonstrated to enhance athletic skills and performances and is commonly used by elite athletes (Cumming et al., 2004; Cumming & Williams, 2012).

Imagery

Imagery is the mental reproduction of an object, scene, or sensation as though it were occurring in reality and may be perceived based on experiences from the past or take place in the future (Driediger et al., 2006). Imagery can incorporate all five senses and may take place from a first or third person perspective, also described as internal or external imagery respectively (Cumming et al., 2004). In the world of athletics, imagery is a prominent performance enhancing technique that has been demonstrated by researchers to improve motor skill acquisition and development, increase self-confidence and motivation, regulate arousal and anxiety, and facilitate coping with injury and pain (Cumming & Williams, 2012; Ievleva & Orlick, 1991; Paivio, 1985). Athletes use imagery most frequently before competition and during training (Driediger et al., 2006); however, its potential to enhance athletic injury rehabilitation may be undervalued as there is substantially less scientific research devoted to the effects of imagery on the injury rehabilitation process as compared to competition and training (Cumming & Williams, 2012).

Functions of Imagery

Paivio's (1985) functions of imagery framework accounts for a variety of imagery applications in the world of sport. In this theory, Paivio (1985) proposes two main functions of imagery, cognitive and motivational, which can each be classified as general or specific (Paivio, 1985). Cognitive-specific imagery includes imagery directed at improving skills or movements, whereas cognitive-general imagery describes imagery related to strategies for a competitive event (Hall et al., 1998). Motivational-specific imagery indicates goal-oriented responses such as winning a competition or receiving a medal (Hall et al., 1998). Motivational-general imagery is divided into two categories to differentiate between mastery, meaning imagery of staying focused and mentally tough, and arousal, indicating imagining the feelings of arousal or anxiety that can accompany performance (Hall et al., 1998). These constructs are purportedly orthogonal in nature and measured independently of one another, meaning an athlete can have high or low ability in any combination of imagery functions, including motivational-general arousal and motivational-general mastery (Hall et al., 1998). The proposed cognitive and motivational functions of imagery can be applied to athletes undergoing injury rehabilitation to improve motor skills after injury and improve motivation and confidence for returning to sport, respectively.

Mechanisms Explaining Imagery

Multiple mechanisms have been proposed to explain the enhancing effects of imagery on motor skill acquisition. The concept of functional equivalence holds that performing imagery activates the same areas and processes in the brain as when an activity is actually executed; therefore, performing imagery strengthens neural pathways involved in specific movements and consequently improves motor skills and performance (Jeannerod, 2001). Authors of the PETTLEP model of imagery expanded on the idea of functional equivalence, emphasizing the importance of creating the most lifelike images possible by including perspective, emotion, time, task, learning, environment, and physical aspects into imagery practice (Holmes & Collins, 2001). For example, using the PETLEP model, a goalkeeper imaging a penalty kick would incorporate things such as their point of view from the goal, feelings of nervousness or excitement that naturally occur during competition, cues for how they want to move once the ball is kicked, the sounds of the stadium and the fans, and the feeling of the air or clothes on their skin in order to make their imagery more effective. Alternatively, bioinformational theory emphasizes the importance of imaging the response along with the stimulus to code information into the long-term memory (Lang, 1979). For example, instead of imaging only the ball being kicked (stimulus), the goalkeeper would also image themselves blocking the ball successfully and feeling pleased (response) with the results. Additionally, Lang (1979) argues that the more realistic and vivid the images are, the stronger the physiological response will be when the real situation occurs. Researchers have demonstrated that athlete performance has improved more through performing stimulus and response imagery compared to stimulus imagery alone with respect to skill-based motor tasks (Smith & Collins, 2004) and that stimulus and response oriented imagery results in greater physiological reactivity and EEG activity compared to stimulus imagery alone (Cumming et al., 2007).

Alternative mechanisms have been proposed to explain the reducing effect of imagery on perceived pain. Gate control theory postulates that painful afferent stimuli can be blocked at the dorsal horn of the spinal cord before reaching levels of conscious awareness if the pathway is simultaneously occupied (Melzack & Wall, 1965). Guided imagery can provide ample sensory input to effectively occupy the dorsal horn and prevent painful stimuli from being perceived by the brain (Kwekkeboom et al., 1998; Melzack & Wall, 1965). Gate control theory emphasizes the overriding influence that cognitive control can have on central nervous system processing (Melzack & Wall, 1965). The theory also implies an explanation for individual differences in the effects of imagery on pain reduction: vividness of image generation and absorption in imagination may lead to better performance of imagery, which may result in stronger imagery output and therefore increase blocking of pain signals at the dorsal horn (Kwekkeboom et al., 1998; Melzack & Wall, 1965). The self-regulation theory complements and extends predictions of the gate control theory (Johnson, 1999; Kwekkeboom et al., 1998). In short, the model proposes that when there is a discrepancy between a desired state and a present state, coping responses will be initiated to regulate physical and emotional responses (Johnson, 1999). For example, a person experiencing stimuli perceived as stressful or painful may initiate coping mechanisms to decrease the anxiety response and regulate levels of cognitive anxiety or pain. Guided imagery is an example of a cognitive strategy capable of decreasing the anxiety response through mechanisms described in the gate control theory (Johnson, 1999; Kwekkeboom et al., 1998; Melzack & Wall, 1965).

Effects of Imagery on Healing-Related Factors

A strong body of literature exists in the medical world supporting the enhancing effects of imagery on healing-related factors including immune system functioning, stress levels, and perceptions of pain (e.g., Carrico et al., 2008; Donaldson, 2000; Lee et al., 2013). In regards to immune system functioning, researchers conducting a psychoneuroimmunological study examined the effects of imagery on the immune system response in patients diagnosed with a variety of medical problems associated with a depressed white blood cell count (Donaldson, 2000). Participants received a guided imagery recording targeting increased production of white blood cells over the course of a 90-day intervention (Donaldson, 2000). The researcher found statistically significant increases in white blood cell counts; however, this study was limited due to the small sample size ($N = 20$), lack of a control group, and failure to examine other measures of immune system response. Researchers utilizing a similar intervention studied the effects of guided imagery on natural killer cell cytotoxicity in patients ($N = 28$) undergoing surgery for early-stage breast cancer (Lengacher et al., 2008). Before surgery, the intervention group received a one-on-one relaxation and guided imagery session and a guided imagery recording they were instructed to listen to three times per week while the control group did not receive any extra attention (Lengacher et al., 2008). Four weeks after surgery, the intervention group had elevated natural killer cell cytotoxicity compared to the control group (Lengacher et al., 2008), which is important for removing cancer cells and maintaining proper immune system functioning (Bakke et al., 2002). Taken together, these studies demonstrate that guided imagery may induce changes in white blood cell counts, which can facilitate healing and strengthen the immune system (Bakke et al., 2002; Donaldson, 2000; Lengacher et al., 2008).

Using imagery may also be an effective way to decrease stress levels. Researchers examining the effects of an imagery intervention on stress and fatigue in patients with thyroid cancer measured changes in heart rate variability, an indicator of sympathetic activation, and self-report measures over time (Lee et al., 2013). Three weeks before chemotherapy treatment began, the experimental group (n = 47) was given a guided imagery CD and instructed to listen every night around bedtime for four weeks and the control group (n = 43) was provided general information about chemotherapy. The measurements were recorded at baseline, immediately before starting chemotherapy (3 weeks into the intervention), and at the end of the intervention. Over time, the experimental group demonstrated an increase in heart rate variability, which is indicative of decreased sympathetic activation, and reductions in perceived levels of stress and fatigue, which was indicated by self-report measurement results. Similarly, a study examining the effects of various relaxation techniques on HIV-Seropositive women (N = 150) showed guided imagery with diaphragmatic breathing was more effective in reducing cortisol levels than progressive muscle relaxation or autogenic training with diaphragmatic breathing (Jones et al., 2014). Furthermore, the magnitude of cortisol reduction increased over time, indicating a potential learning effect over the course of the intervention. In Jones et al's (2014) study, the intervention was longer and more intense than Lee et al. (2013), who used 10 weekly 120-minute sessions, where 90 minutes was allocated to stress management and 30 minutes to relaxation components.

Imagery has also been extensively used in the medical world to reduce pain levels. A study examining the effects of guided imagery on women with interstitial cystitis found reductions in pain over the course of an 8-week intervention along with a decrease in episodes of urgency (Carrico et al., 2008). In this experiment, recordings were specific to interstitial cystitis symptoms and emphasized relaxation and healing of pelvic muscle groups through images such as warm rays of sunshine (Carrico et al., 2008). Using a similar intervention, Manyande et al. (1995) researched the effects of preoperative imagery on postoperative pain in 51 male and female patients, between 22 and 76 years old, who underwent colorectal or anal surgery. The experimental group received an imagery recording focused on successful coping with surgical stress and the control group received a recording about general hospital information. Over time, the treatment group reported less pain and made fewer requests for analgesia compared to the control group (Manyande et al., 1995). Taken together, research in the medical world provides support for imagery as a non-invasive way to enhance immune system functioning, decrease acute and chronic stress levels, and decrease perceptions of pain (Donaldson, 2000; Lee et al., 2013; Manyande et al., 1995).

Types of Imagery in Athletic Injury Rehabilitation

In sport, rehabilitation from injury is a therapeutic approach to the prevention, evaluation, and treatment of injuries using techniques that may include injury education, physical therapy, at home exercise routines, and pain management. Multiple types of imagery have been described during athletic injury rehabilitation, including healing, pain management, rehabilitation process, and performance imagery (Taylor & Taylor, 1997). Athletes may use some or all of these types of imagery throughout the rehabilitation process (Richardson & Latuda, 1995). Healing imagery involves creating images in one's mind that represent a particular disease or injury as well as the physiological coping response and effect that accompanies the treatment (Heil, 1993). In other words, healing imagery is when one imagines tissues or bones successfully healing or the body repairing itself. According to Driediger et al. (2006), healing imagery can be internal, such as visualization of tissues mending and strengthening, or external, such as imagining oneself from a third-person perspective returning to competition with full strength of the injured area. For example, a soccer player with a torn meniscus may imagine the tissues mending while icing the injured area or imagine themselves competing in a future match when the injury is fully healed. Pain management imagery includes practicing dealing with expected pain, using imagery as a distraction from pain, or imagining pain dispersing or being blocked, which can help athletes emotionally cope with pain and reduce pain levels (Driediger et al., 2006). In this instance, the soccer player may imagine a peaceful scene during a painful rehabilitation exercise or create a more literal image of the pain dispersing away from their meniscus. Rehabilitation process imagery involves creating images related to completing exercises, adhering to the prescribed program, overcoming setbacks and obstacles, and maintaining a positive and focused attitude (Heil, 1993; Ievleva & Orlick, 1991). For example, if the same soccer player worries about having enough time to attend physical therapy, they may imagine consistent, successful attendance and a positive attitude during rehabilitation. Performance imagery entails rehearsal of sport-specific skills or imagining oneself returning to practice and competition, which can decrease anxiety surrounding the return to sport and also increase motivation during the rehabilitation process (Richardson & Latuda, 1995). The soccer player may use performance imagery when they imagine a successful and complete return to practices and games. Researchers have studied the use of these four imagery types throughout the athletic injury rehabilitation process.

Imagery during Athletic Injury Rehabilitation

Many researchers performing qualitative studies have found that injured athletes use multiple types of imagery during rehabilitation. Male and female athletes from a variety of sports and competitive levels described using imagery the most during physical therapy sessions rather than before or after; however, they report using imagery more frequently before competition and during practice compared to during rehabilitation (Driediger et al., 2006). Additionally, athletes described using imagery for cognitive, motivational, healing, pain management, and injury prevention purposes and noted that the type of imagery used changed depending on the stage of rehabilitation (Driediger et al., 2006). Furthermore, researchers interviewed male and female elite athletes at different stages of rehabilitation and found that the functions of their imagery use changed over time: athletes reported using healing and pain management imagery in the early phase of rehabilitation and transitioned towards cognitive specific imagery to rehearse sport-specific performance skills towards the end phase of rehabilitation (Evans et al., 2006).

Wesch et al. (2012) explored the relationship between imagery use and adherence to injury rehabilitation. Injury rehabilitation adherence can be measured by factors such as appointment attendance, practitioner ratings, home exercise completion, or home cryotherapy completion (Brewer et al., 2000). In a study on Canadian athletes competing in various sports and competition levels (majority were recreational athletes) who were attending physical therapy at least once per week, researchers measured male and female athletes' (N = 90) imagery use over the course of 8-weeks of rehabilitation (Wesch et al. 2012). Researchers found a positive association between motivational imagery use and rehabilitation adherence with respect to frequency and duration of rehabilitation, especially during the middle and later stages of healing. In other words, imaging the achievement of treatment goals may positively influence how often and for how long an athlete will perform rehabilitation exercises (Wesch et al., 2012).

A few intervention studies have examined the effects of imagery on physical outcomes of athletic injury rehabilitation. Physical outcomes in injury rehabilitation can include factors such as muscle strength and endurance, pain, mobility, or range of motion. In a randomized controlled clinical trial, a sample of male and female participants (N = 30) ranging from 18-50 years old who had arthroscopic knee surgery were divided into treatment, control, and placebo groups

(Cupal & Brewer, 2001). The treatment group received ten individual sessions of relaxation and guided imagery, which emphasized specific biological healing processes, positive coping responses, and used a variety of imagery modalities. For example, imagery sessions towards the beginning of the recovery process emphasized reduction of knee trauma and acceptance of limited range of motion, whereas sessions later in the recovery process included peak physical performances and a full restoration of strength. The placebo group received extra attention and encouragement and were asked to visualize peaceful scenes during their free time and the control group followed the normal course of physical therapy and did not receive any extra attention or support. At the end of the six month intervention, the treatment group demonstrated greater knee strength, lower reinjury anxiety, and less pain than participants in the placebo and control groups (Cupal & Brewer, 2001). Similarly, a study conducted on patients who had arthroscopic knee surgery (N = 10) were randomly divided into treatment and control groups, where the former listened to their physiotherapist read an imagery script with a general, motivational, and kinesthetic emphasis immediately before 15 physical therapy sessions (Wilczynska et al., 2015). Imagery content included feeling the ligament healing, functioning smoothly, and being surrounded by strong musculature. At the end of the study, the treatment group experienced less post-operative pain, greater improvement in knee flexion, and post-operative leg circumference compared to the control group, who only received physical therapy (Wilczynska et al., 2015). Furthermore, Hoyek et al. (2014) investigated the effectiveness of a motor imagery intervention on the functional rehabilitation of stage II shoulder impingement syndrome with respect to mobility and pain. Over the course of ten individual physical therapy sessions, researchers instructed the experimental group to integrate motor imagery exercises into sessions during rest time between exercises by demonstrating the movements, then researchers instructed participants to imagine the same movement as slowly and vividly as possible before executing the exercise (Hoyek et al., 2014). As a result, the treatment group (n = 8) exhibited statistically significant increases in range of motion, shoulder function, and a decrease in pain compared to the control group (n = 8), who received extra attention during physical therapy from the lead researcher (Hoyek et al., 2014). Taken together, these intervention studies show multiple types of imagery can enhance physical recovery outcomes including range of motion, pain perception, and strength in the knee and shoulder (Cupal & Brewer, 2001; Hoyek et al., 2014; Wilczynska et al., 2015).

Other intervention studies using imagery during athletic injury rehabilitation yielded more mixed results regarding physical outcomes. In each of these studies, imagery sessions began with a relaxation technique and were tailored to participants' current rehabilitation goals (Christakou et al., 2007; Christakou & Zervas, 2007).For example, when assessing the effects of a guided imagery intervention on the functional rehabilitation of grade II ankle sprains in male and female athletes between 18 and 30 years old (N = 20), researchers found that imagery had positive effects on muscular endurance, assessed through heel-rise and toe-rise tests; however, no significant differences were observed in dynamic balance and functional stability (Christakou et al., 2007). Additionally, researchers conducted a similar study assessing pain, edema, and range of motion during grade II ankle sprain rehabilitation in 18 male athletes between 18 and 30 years old (Christakou & Zervas, 2007). Researchers did not find differences in pain, edema, or range of motion between groups receiving guided imagery in addition to treatment and groups receiving treatment alone (Christakou & Zervas, 2007), which directly contradicts results from imagery interventions including participants with knee and shoulder injuries (Cupal & Brewer, 2001; Hoyek et al., 2014; Wilczynska et al., 2015). Overall, there are mixed results surrounding the effectiveness of imagery to reduce pain and increase range of motion in athletes with ankle injuries (Christakou et al., 2007; Christakou & Zervas, 2007).

One limitation of the aforementioned intervention studies is a lack of injury variety among participants within each study, which limits the generalizability of the results to individuals with different injuries than those previously studied. Another common limitation is the lack of psychological assessments, which fails to provide information on the potential psychological effects of imagery use during rehabilitation. In line with proponents of multidimensional sport injury models, psychological responses to injury and an individual's perceived ability to cope with the injury and rehabilitation process play an important role in healing and recovery (Brewer et al., 2002; Wiese-Bjornstal et al., 1998) and therefore should be considered when implementing a mental skill intervention One's perceptions of capabilities on multiple levels, or self-efficacy, is an important psychological concept to consider when thinking about psychological responses to injuries.

Self-Efficacy

Self-efficacy refers to one's beliefs and expectations about their ability to execute a specific task or skill in a given environment (Bandura, 1977). Bandura (1977) argued that processes of psychological and behavioral change occur through the alteration of one's self-efficacy. The theory maintains that three basic processes govern one's behavior: self-efficacy expectancies, outcome expectancies, and outcome value (Bandura, 1977). Self-efficacy expectancies are beliefs concerning one's ability to execute a task. Outcome expectancies are beliefs that certain courses of action will lead to certain outcomes. Lastly, outcome value is the subjective value one places on certain outcomes (Bandura, 1977). Outcome expectancies and self-efficacy expectancies are differentiated because individuals may think certain courses of action may lead to certain outcomes; however, if they do not believe they possess the skills required to execute the necessary course of action, their behavior will not be influenced (Bandura, 1977). Therefore, self-efficacy expectancies play an extremely important role in governing human behavior (Bandura, 1977).

According to Bandura (1977), the principle sources of self-efficacy expectancies include past performance accomplishments, vicarious experiences, verbal persuasion, and physical and emotional arousal. Performance accomplishments are the strongest predictor of self-efficacy and are based on past personal mastery experiences in identical or similar tasks, where past success raises efficacy expectations and failures lower them (Bandura, 1977). Additionally, after repeated successes, occasional failures have a smaller negative impact on self-efficacy (Bandura, 1977). Vicarious experiences can include live or symbolic modeling, which includes a person watching another person perform activities, or by personally performing imagery of successfully completing an activity oneself (Bandura, 1977). Verbal persuasion is when people are led to believe, through someone else's or their own words or suggestion, that they can successfully cope or achieve executing a task they have failed at in the past (Bandura, 1977). Lastly, levels of physical and emotional arousal can influence self-efficacy positively or negatively depending on the task and the individual's perception or interpretation of their arousal as enhancing or debilitating (Bandura, 1977). For example, people tend to rely on arousal levels when judging their vulnerability to stressful situations: if physiological arousal is perceived as too high (a person notices their palms sweating or legs shaking), performance is usually impaired, which leads to individuals believing they can succeed only when arousal levels are in lower ranges (Bandura, 1977).

Self-efficacy has been classified by exercise psychologists into two types: task and coping efficacy (Maddux, 1995). In the context of injury rehabilitation, task efficacy includes an individual's belief in their ability to perform a specific type of rehabilitation exercise, whereas coping efficacy involves an individual's belief in their ability to adhere to a physical therapy regime despite time constraints or personal challenges (Wesch et al., 2012). Furthermore, coping efficacy is related to complex adaptations such as dealing with emotional and physical discomfort or coping with disapproval, whereas task efficacy has to do with elemental acts and motor skills (Maddux, 1995). Maddux (1995) explained that coping self-efficacy is more important than task self-efficacy because most life goals and achievements are emotionally bound and typically do not require performance of physically demanding tasks; however, in rehabilitation scenarios, both types of self-efficacy may be necessary for a successful return to sport.

Self-Efficacy, Treatment Adherence, and Rehabilitation Outcomes

Higher levels of self-efficacy (i.e., the amount) are associated with better adherence to a rehabilitation program. For example, in a correlational study assessing health beliefs of parents of children with muscular dystrophy, researchers found that higher levels of self-efficacy were associated with greater intentions and behavior to help their child adhere to the treatment (Flynn et al., 1995). In other words, parents who held stronger beliefs in their ability to carry out the treatment regimen and believed in its effectiveness were more likely to help their children adhere to the program (Flynn et al., 1995). In another study involving male and female patients (ages 23-88) with upper extremity injuries ($N = 62$) receiving treatment in an outpatient orthopedic rehabilitation facility, researchers investigated the relationship of various psychological factors with compliance and satisfaction with home exercise programs (Chen et al., 1999). Researchers found a positive correlation between self-efficacy, which was measured as a single construct, and home exercise treatment program adherence, which was measured via self-report (Chen et al., 1999). However, in a different longitudinal study, when patients were discharged from a hospital for coronary heart disease over the course of a year, barrier self-efficacy was not predictive of long-term exercise behavior (Slovinec D'Angelo et al., 2014). In this study, barrier self-efficacy was measured with a 12-item scale assessing emotional, social, task-related, and physical barriers to exercise participation, when participants were asked to indicate their confidence, using a 7-point Likert scale, in their ability to engage in regular exercise despite these barriers. Results indicated that autonomous motivation, which is when one engages in behavior because it is self-determined (Deci & Ryan, 2012) and self-efficacy, were positively correlated with exercise adherence at six months; however, only autonomous motivation was predictive of long term behavior (Hagger et al., 2014; Slovinec D'Angelo et al., 2014). In contrast, when considering athletic injury rehabilitation, Milne et al. (2005) found that task efficacy was positively correlated with quality and duration of rehabilitation exercise performance and coping efficacy was positively correlated with frequency and duration of exercise performance. A major limitation of the aforementioned studies is that the relationship between self-efficacy, exercise behavior, and adherence were examined through correlational design, which limits the ability to establish causation and eliminate confounding variables (Chen et al., 1999; Flynn et al., 1995; Milne et al., 2005; Slovinec D'Angelo et al., 2014).

Similar to imagery, self-efficacy may also have a relationship with the physical outcomes of injury rehabilitation. In a study examining elderly patients (N = 55, M_{age} = 82) hospitalized with a hip fracture, rehabilitation self-efficacy, defined as a patient's confidence in their ability to perform rehabilitation protocols, was positively associated with a greater likelihood of recovering locomotive function six months after surgery, even when controlling for depressive symptoms (Fortinsky et al., 2002). Similarly, researchers examined the relationships between pain, functional ability, self-efficacy, and depression in male and female patients (N = 220, M_{age} = 70) with a total knee replacement due to osteoarthritis (Wylde et al., 2012). Results indicated that preoperative self-efficacy was predictive of functional ability one year after surgery (Wylde et al., 2012). An important limitation of both studies is the correlational design, which fails to control for confounding variables, like social support or psychological skills use, and also does not establish a clear cause and effect relationship (Fortinsky et al., 2002; Wylde et al., 2012). Overall, there exists preliminary evidence supporting the positive relationship between self-efficacy and both treatment adherence and physical rehabilitation outcomes; however, more intervention studies are needed to establish causation.

Self-Efficacy and Perceived Pain

Self-efficacy may alter a person's interpretation of painful sensations, a commonplace occurrence after injury. In a cross-sectional study, researchers examined the relationships between self-efficacy and pain during the performance of stair climbing and lifting/carrying tasks on speed of movement, perceived task ability, and rating of task difficulty in patients with knee osteoarthritis (Rejeski et al., 1996). Participants (N = 79, M_{age} = 68.8) were predominantly white, male and female community dwelling adults (Rejeski et al., 1996). Task-specific efficacy beliefs were measured with a confidence ladder asking participants to rate their level of certainty from 0 (*completely uncertain*) to 10 (*completely certain*) that they could complete the activity anywhere from two to ten times without stopping. At post-test, pre-task self-efficacy measurements and knee pain experienced during the activity were predictive of speed of movement, perceived physical ability, and rating of task difficulty, emphasizing the role of self-efficacy beliefs in arthritic management. Pain also had a positive relationship to physical disability independent of its role through self-efficacy, which suggests that pain is an aversive experience that may limit those with high self-efficacy (Rejeski et al., 1996). Similarly, Somers et al. (2012) conducted a cross-sectional study to determine how self-efficacy for pain control and pain catastrophizing are related to pain, stiffness, fatigue (i.e., objective disease activity), and psychological distress in patients with systemic lupus erythematosus. Participants completed measures of pain coping cognitions and rated their physical symptoms along with their psychological distress. Additionally, physicians were asked to objectively evaluate their patients' lupus disease activity with a validated assessment tool including clinical and laboratory measures. After controlling for demographic and medical variables including age, race, and disease activity, patients' scores on the objective measures of disease activity were not associated with reported pain, fatigue, and mood; however, participants with low self-efficacy for pain control were more likely to report symptoms of pain, stiffness, and fatigue. These results demonstrate that objective disease activity assessments utilizing physical measures may not adequately reflect someone's quality of life or subjective experience (Somers et al., 2012). The combined results of these studies suggest the necessity of shifting towards multidisciplinary approaches in medical treatment to address psychological factors, such as different types of cognitions (e.g., pain coping, self-efficacy), as they may play an important role in patients' quality of life or rehabilitation outcomes (Rejeski et al., 1996; Somers et al., 2012).

Self-Efficacy and Stress

Self-efficacy may have a buffering effect against stress. Guo et al. (2019) investigated the influence of high-level athletes' coping self-efficacy on the cognitive processing of psychological stress by measuring brain activity during a mental arithmetic task with characteristics of uncontrollability and socially evaluated threat. Researchers measured FRN and P300 latency and amplitudes; FRN indicates the cognitive processing of expected errors, where larger amplitudes reflect a faster response to threatening situations (Holroyd & Coles, 2002), and

P300 indicates selective attention and larger amplitudes reflect a greater number of cognitive resources are occupied (Kopp & Lange, 2013). Comparing results of the athletes with high and low coping self-efficacy, the former coped better with stressful events, responded more quickly, and focused more on processing positive information compared to the latter (Guo et al., 2019). Further, in a study examining perceived self-efficacy in exercising control over extreme stressors on the immune system, researchers found that stress activated during the process of gaining coping efficacy was immunoenhancing in that it enhanced lymphocyte and T-cell function and therefore may increase the rate of healing (Wiedenfeld et al., 1990). In summary, athletes with higher coping efficacy who experience a stressful event, such as an injury, may heal at a faster rate than those with lower coping efficacy due to increased immune system functioning, an increased ability to cope with stressful events, and allocation of cognitive resources to relevant and immediate tasks (Wiedenfeld et al., 1990).

The Relationship Between Imagery and Self-Efficacy

Imagery and self-efficacy are related in that imagery is one proposed source of self-efficacy, and self-efficacy can, in turn, can influence behaviors and actions, such as engaging in imagery practice (Bandura, 1977). Further, imagery may act as a source of self-efficacy for tasks through direct and indirect mechanisms. A direct way imagery purportedly influences self-efficacy is by serving as a vicarious experience, which can include live or symbolic modeling (Feltz & Riessinger, 1990). Performing imagery is a form of symbolic modeling that can involve a person seeing and feeling themself, or another person, perform a given task where imaging success can increase one's belief that they possess the capabilities to do so (Feltz & Riessinger, 1990). Imagery may also affect self-efficacy indirectly given that imagery can influence or be influenced by past performance accomplishments, verbal persuasion, and physical/emotional states, the other sources of self-efficacy (Bandura, 1977). Given the strong body of research supporting the ability of imagery to improve motor skills and performance (Cumming & Williams, 2012), one could argue that practicing imagery could increase the amount of past performance successes and consequently lead to increases in self-efficacy (Bandura, 1977). In regard to the verbal persuasion source of self-efficacy, employing imagery scripts using words of affirmation or positive self-talk could also lead to increases in self-efficacy (Bandura, 1977). Lastly, imagery can modify physical and emotional states, which could in turn increase self-efficacy (Pictet et al., 2011). For example, if someone who judges feelings of muscle tension or increased arousal as a sign of increased likelihood of a bad performance, performing relaxation imagery could decrease their tension and arousal to a state they view as optimal for success. Furthermore, performing positive imagery could also enhance one's mood, which has been demonstrated by researchers to have an enhancing effect on perceived self-efficacy and increased physiological activation due to heightened levels of excitement and arousal (Kavanagh & Bower, 1985; Pictet et al., 2011).

Research on Imagery and Self-Efficacy in Athletes

In the realm of sport, researchers have found that imagery use is a powerful performance enhancing technique during both practice and competition. Imagery has been associated with improved motor skills, increased motivation, improved ability to regulate arousal and anxiety, and increased levels of self-efficacy (Cumming & Williams, 2012; Ievleva & Orlick, 1991; Munroe-Chandler et al., 2008; Paivio, 1985). In a correlational study, researchers administered measurements to a group of male and female individual sport intercollegiate varsity athletes (N = 50) assessing sport imagery use and self-efficacy during training and competition (Mills et al., 2000). Researchers found that athletes who scored high in competition self-efficacy used all functions of motivational imagery more than athletes who scored low in competition self-efficacy, although athletes with high and low practice self-efficacy did not differ in cognitive or motivational imagery use (Mills et al., 2000). Using a similar study design, researchers investigated the relationships between imagery use, self-confidence, and self-efficacy in male and female soccer athletes ($N = 122$) competing at both recreational and competitive levels (Munroe-Chandler et al., 2008). Researchers found that imagery use was a significant predictor of both self-confidence and performance self-efficacy in recreational and competitive athletes (Munroe-Chandler et al., 2008). In line with Mills et al. (2000), researchers also found motivational general-mastery imagery accounted for a large percentage of variance (40-57%) for self-confidence and self-efficacy (Munroe-Chandler et al., 2008). Although the nature of correlational studies limits assumptions about causality and directionality, taken together, these findings suggest a positive relationship between motivational imagery and self-efficacy in both individual and team sports, regardless of competitive level (Mills et al., 2000; Munroe-Chandler et al., 2008).

Other researchers explored the relationship between imagery and self-efficacy in sport practice and competition in experimental studies. Using a single-subject design, Parkerson et al. (2015) explored the effects of an individualized motivational general-mastery intervention on sport performance self-efficacy in a group of five youth gymnasts ($M_{age} = 10.8$) competing at a high level. Over the course of the intervention, participants met with the lead researcher twice a week for three weeks and also completed three imagery homework assignments per week for a total of five imagery sessions per week. During the meetings, the researcher read the athlete an individualized imagery script, which included feeling confident and in control of performance, overcoming a challenging gymnastics scenario, and feeling mentally tough. As a result, one athlete demonstrated an increase in self-efficacy for gymnastics, one athlete had stable self-efficacy, and three athletes' self-efficacy decreased over the course of the intervention. Researchers suggested potential causes for these results include high levels of reported self-efficacy for gymnastics during baseline phases (i.e., a possible ceiling effect) and the occurrence of significant setbacks during gymnastics that were unrelated to the imagery intervention (Parkerson et al., 2015). Using a similar intervention design and population sample, O et al., (2013) employed a single-subject multiple-baseline design to investigate the use of a highly individualized motivational general-mastery imagery intervention on the self-efficacy for squash of five male and female youth squash athletes (M_{age} = 10.8). Over a six-week intervention period, researchers instructed athletes to practice imagery three times per day and met individually with the lead researcher twice per week to perform imagery practice. The imagery scripts in the study included themes of mental toughness, feeling confident and controlled, and described a successful performance. Over time, three of the five participants demonstrated increases in self-efficacy for squash after receiving the imagery intervention. Additionally, participants with the greatest increases in motivational general-mastery use during the intervention phase also increased their self-efficacy the most, suggesting the potential existence of a dose-response relationship (O et al., 2014). Taken together, research indicates that athletes' self-efficacy for sport practice and competition performance may be positively influenced by imagery use, specifically when motivational general-mastery functions are emphasized (Mills et al., 2000; Munroe-Chandler et al., 2008; O et al., 2014).

Imagery and Self-Efficacy During Injury

Although Driediger et al. (2006) found that athletes use imagery during practice and competition more often than during injury rehabilitation, a psychophysiological perspective suggests the relevance of using imagery to aid in healing and injury recovery through the same mechanisms that imagery operates to improve performance during training and competition.

Self-efficacy, a variable which can operate in conjunction with, or is a result of imagery, has been supported by research to decrease pain and stress (Guo et al., 2019; Somers et al., 2012), increase rehabilitation adherence (Chen et al., 1999), and improve physical treatment outcomes (Fortinsky et al., 2002). Research in sport practice and competition has demonstrated that using imagery can enhance performance self-efficacy; therefore, imagery may also be an important mental skill for increasing athletes' injury rehabilitation self-efficacy. In order to measure athletes' imagery use during injury, Sordoni et al. (2002) developed the Athletic Injury Imagery Questionnaire – 2 (AIIQ-2), which had three distinct factors including healing, motivational, and cognitive imagery. The scale was later revised and renamed the AIIQ-3 by Wesch et al. (2016) to include pain management imagery as a fourth factor after further research was conducted on the types of imagery athletes use while undergoing rehabilitation. The AIIQ-3 assessment prompts participants to rate their perceived frequency of imagery use on a 9-point Likert scale ranging from 1 (*never*) to 9 (*always*) and contains 16 items in total (Wesch et al., 2016). To evaluate self-efficacy during injury rehabilitation, Milne et al. (2005) developed the AISEQ (Athletic Injury Self-Efficacy Questionnaire), which is a 7-item measurement that requires participants to rate their self-efficacy for each statement on a confidence scale ranging from 0% (*no confidence*) to 100% (*completely confident*) and assesses task and coping efficacy as individual factors (Milne et al., 2005). Although these validated measures are available, there exists a limited body of correlational and experimental research surrounding the connection between different types of imagery and self-efficacy during rehabilitation.

Correlational Research on Imagery and Self-Efficacy During Injury.

With respect to athletic injury rehabilitation, there is often a positive correlation between various types of imagery and self-efficacy. The first known investigation of the relationship between imagery and self-efficacy during athletic injury rehabilitation included a group of 217 male and female athletes competing at recreational and competitive levels (Sordoni et al., 2002). Researchers administered the AIIQ-2 and the Injury Self-Efficacy Questionnaire (ISEQ; a preliminary version of the AISEQ; Sordoni et al., 2002), to the athletes during a physical therapy appointment. The results indicated a positive correlation between healing imagery and injury self-efficacy; however, no relationship was found between cognitive or motivational imagery and injury self-efficacy. Sordoni and colleagues' (2002) study was limited because injury rehabilitation self-efficacy was evaluated as a single construct rather than measuring task and coping efficacy independently. Additionally, the psychological assessments were only given at a single time point during rehabilitation, which limits the researchers' ability to analyze changes in the types of imagery use over time and their relationship to injury self-efficacy. In a subsequent correlational study including more than 200 athletes with various sport and competition level backgrounds ranging from 18-74 years old, Milne et al. (2005) investigated the relationship between imagery use during injury, task and coping self-efficacy, and rehabilitation adherence (measured through self-report questionnaires related to quality, frequency, and duration of physical therapy exercise performance). Similar to Sordoni et al. (2002), Milne and colleagues (2005) administered the AISEQ, which was modified from the ISEQ and designed specifically for athletes, and the AIIQ-2 during a single physical therapy appointment (Milne et al., 2005). Results indicated that cognitive imagery use during the injury rehabilitation process was positively correlated with task efficacy and both task and coping efficacy were positively correlated with rehabilitation adherence (Milne et al., 2005). In summary, the aforementioned correlational studies show a potential positive relationship between healing and cognitive imagery with self-efficacy during injury rehabilitation (Milne et al., 2005; Sordoni et al., 2002).

Intervention Research on Imagery and Self-Efficacy During Injury.

Researchers using intervention techniques have found mixed results regarding the relationship between imagery use and self-efficacy during injury rehabilitation. For example, Cressman and Dawson (2011) investigated the effectiveness of a guided healing imagery intervention on self-efficacy and healing time in a sample of 13 injured varsity-level male and female intercollegiate athletes. The authors measured self-efficacy with the AISEQ and measured healing time using a self-report daily sport activity journal along with physical strength and flexibility tests. In this study, the imagery intervention was administered using a physical script that was initially read to participants by the lead researcher. Additionally, the intervention group received copies of the imagery scripts each week and were encouraged to practice on their own and personalize the scripts to make it more meaningful to them. Weeks one through two of the imagery intervention script were specific to internal healing imagery, which focused on the physiological healing process of the body. The script changed at weeks three through eight and was specific to external healing imagery, which centered around athletes feeling healthy and returning to their sport at their prior level of functioning. Over time, no differences were observed between the experimental and control groups in self-efficacy or healing time (Cressman & Dawson, 2011). In this study, researchers also used the AIIQ-2 as a manipulation check for imagery use, which revealed no statistically significant differences in the frequency of athletes' imagery use between the intervention and control groups (Cressman & Dawson, 2011). Results from the manipulation check indicated that the control group was using self-directed healing imagery during their recovery, which may have contributed to the lack of differences between groups (Cressman & Dawson, 2011). Despite no differences in the frequency of imagery use between groups, during qualitative follow-up interviews, participants in the intervention group reported greater satisfaction with rehabilitation from week two to week three and expressed that the imagery intervention increased their injury awareness and improved their rehabilitation adherence (Cressman & Dawson, 2011).

Applying a broader perspective, Zach et al. (2018) conducted a meta-analysis examining the effects of using mental imagery during injury rehabilitation on post-injury functional mobility, pain, and injury self-efficacy (Zach et al., 2018). Utilizing data from 10 research studies, no overall statistically significant effects of imagery use on any of the aforementioned variables were found by the researchers; however, large positive trends were shown regarding the effect of imagery on injury rehabilitation self-efficacy. Researchers reported the overall lack of statistical significance in the meta-analysis was largely due to heterogeneous population samples amongst the studies in addition to a lack of statistical power, reflecting the need for more experimental research on mental imagery and athletic injury rehabilitation as well as larger samples (Zach et al., 2018). Although Cressman and Dawson (2011) and Zach et al. (2018) did not find a positive relationship between imagery use and rehabilitation self-efficacy in injured athletes, limitations to past research on this topic such as cross-sectional design or small samples sizes may have affected the outcome of these studies due to the types of statistical analysis employed. Due to the complexity of psychological and physical factors contributing to athletic injury outcomes and the non-linear path of healing, different experimental approaches, such as single subject design, may provide more relevant information regarding the psychological effects of an imagery intervention on injury rehabilitation variables rather than illuminating significant differences between groups.

In contrast, some researchers have found a positive effect of imagery interventions on rehabilitation self-efficacy during athletic injury rehabilitation. For example, researchers conducted an intervention study including participants undergoing first-time ACL reconstructive surgery (N = 21, M_{age} = 34.86) to explore the effects of guided imagery sessions on rehabilitation self-efficacy, neurobiological factors related to stress, and knee laxity (Maddison et al., 2012). The guided healing imagery intervention included specific biological processes (e.g., knee range of motion increasing), positive coping responses (e.g., confidence in ACL integrity towards the end of physical therapy), and imagery modalities (e.g., kinesthetic and visual) that varied and evolved with each stage of ACL reconstruction healing). Participants in the intervention group received weekly one-on-one imagery sessions with a trained research assistant, who also gave participants audio recordings of imagery to use between physical therapy sessions. Over the course of the nine-week intervention, the treatment group had greater improvements in knee laxity and markers of stress (i.e., decreases in noradrenaline and dopamine) compared to the control group. Self-efficacy, measured as a single construct in this study, decreased in both groups over time, but less so in the experimental group. Researchers speculated the decline in self-efficacy observed in both groups over time was due to participants having unrealistic pre-operative beliefs because they were unsure what to expect (Maddison et al., 2012). Because self-efficacy may decline over time during the rehabilitation of serious injuries, a continued pursuit of interventions aimed at maintaining or improving rehabilitation self-efficacy levels is needed to assist people with injuries both physically and psychologically when rehabilitation takes longer than expected or does not progress as planned.

In another study measuring changes in self-efficacy over time, Wesch et al. (2016) used a multiple-baseline single subject design to measure the effectiveness of an educational imagery intervention on task and coping self-efficacy prior to the start of physical therapy treatment. This study included six male and female participants (M_{age} = 49.5) who sustained a Type B malleolar fracture requiring immobilization for six weeks following surgery but before commencing physical therapy. Participants in the study reported engagement in walking, horseback riding, and rugby as their physical activities of choice. Five participants received the imagery intervention, one did not. Researchers performed the imagery intervention over the course of two sessions for two weeks and provided four recorded scripts containing healing, pain management, cognitive, and motivational imagery for participants to choose from for additional daily personal use. As a manipulation check, researchers used the AIIQ-3 to assess the frequency of imagery use and the AISEQ to assess changes in task and coping self-efficacy over time. Imagery use and self-efficacy assessments were completed eleven times over a six-week period between the first meeting and the beginning of physical therapy treatment (Wesch et al., 2016). Imagery use increased over the course of the intervention for all participants, with the exception of the participant who did not receive the intervention, and some reported changing the type of imagery they used over time, which has also been reported in previous research (Evans et al., 2006; Wesch et al., 2016). Consequently, by the end of the experiment phase, task efficacy increased in two out of five participants who received the intervention and coping efficacy increased for three out of the five participants after the intervention (Wesch et al., 2016). Participants who did not exhibit changes in self-efficacy, did report through qualitative measures that the intervention reduced their anxiety and gave them an active role in the recovery process. Because participants' self-efficacy was relatively high at the beginning of the intervention, researchers speculated a potential ceiling effect occurred, which was supported by the relatively stable rehabilitation self-efficacy of the participant who did not receive the intervention. Taken together, these findings (Maddison et al., 2012; Wesch et al., 2016) support the idea that an imagery intervention has the potential to increase self-efficacy during rehabilitation, but further experimental research is needed to support this conclusion.

Summary and Review of Limitations

The majority of empirical research regarding imagery and athletic injury is correlational in nature, which is problematic for a few reasons (Cupal, 1998). First, athletes use imagery more during competition and practice than during rehabilitation, indicating that correlational data might provide misleading information if athletes do not use imagery during injury rehabilitation because they are unaware of the benefits (Driediger et al., 2006). Second, correlational data does not allow for cause-and-effect conclusions or control for potential confounding variables such as personal and situational factors. However, correlational studies provide important preliminary data that support the need for more intervention-based research designs.

Although some findings indicated imagery had a positive effect on self-efficacy during athletic injury rehabilitation and some indicated no effect, the paucity of experimental studies surrounding this topic and the limitations due to the design of the studies warrant the demand for further research. For example, Maddison et al. (2012) employed imagery interventions in their design, using three time points for comparison between the control and treatment groups. Because these groups were both relatively small in size, analyzing mean differences between groups may not have been the most effective way to measure subtle changes in rehabilitation self-efficacy throughout their intervention (Maddison et al., 2012). Additionally, findings by Wesch et al. (2016) cannot be generalized to athletes specifically because the majority of participants identified as recreational exercisers, nor can the conclusions of Maddison et al. (2012) apply to all athletes because their study was limited only to individuals over the age of 16 undergoing first-time ACLR arthroscopic surgery reconstruction. Because athletes may have different cognitive appraisals and emotional reactions than non-athletes to injury (Wiese-Bjornstal et al., 1998) and athletes tend to use imagery more frequently and perceive it as more relevant to their performance compared to recreational athletes (Cumming & Hall, 2002), the former may be more likely to adhere to and benefit from an imagery intervention than the latter. Further, Cressman and Dawson (2011) were the only researchers who included solely competitive athletes as participants and is also the only intervention that included participants who experienced a variety of injuries; however, similar to Maddison et al. (2012), they used a limited pre/post design comparing mean differences to a control group. Therefore, targeting athletes when researching the effects of imagery interventions during athletic injury utilizing a multiple baseline will add to the literature on imagery and injury rehabilitation.

Previous researchers have varied in terms of the amount of choice given to participants regarding which type(s) of imagery to use during injury rehabilitation. For example, one major limitation of Cresssman and Dawson's (2011) study was that healing imagery was the *only* type of imagery included in the intervention. Additionally, Maddison et al. (2012) designed a script that changed over time to match the progression of rehabilitation and return to sport, but it was limited to athletes sustaining ACL injuries and they did not offer participants a choice in which script to use. In contrast, Wesch et al. (2016) gave participants a choice regarding what type of imagery they could use (healing, pain management, cognitive, or motivational). Because previous research findings suggests that personal preferences and phase of rehabilitation play a significant role in what types of imagery athletes prefer to use during rehabilitation (Driediger et al., 2006; Evans et al., 2006) and that changes in the types of imagery use can occur over time (Wesch et al., 2012), giving participants the freedom to choose between imagery scripts was a strength of this study (Wesch et al., 2016) and is in line with self-determination theory (Deci &

Ryan, 2012). Proponents of this theory argue that human motivation is maximized when peoples' basic psychological needs are met. One of these basic needs, autonomy, is defined as the capacity to control one's tendencies based on one's desires, abilities, and freedom to control (Deci & Ryan, 2012). Autonomy is also tied to volitional behavior engagement, which is the faculty by which an individual decides and commits to a particular course of action without a direct external influence (Deci & Ryan, 2012). Providing participants with a choice regarding which type of imagery script to use during injury rehabilitation is therefore in line with quality motivating tactics because it promotes participant autonomy and increases volitional behavior.

In addition to limiting participants to athletes and giving them a choice in which imagery type to practice, perhaps more importantly, additional interventions are needed to test the effects of imagery on the task and coping self-efficacy of athletes *simultaneously* engaging in physical therapy. Although Wesch et al. (2016) found an enhancing effect of imagery use on task and coping self-efficacy in some of their participants, the individuals had to imagine rehabilitation scenarios in the future because the intervention was given *before* participants began a physical therapy regime. Additional empirical support for imagery interventions' real time effects on self-efficacy during injury rehabilitation is warranted, especially because rehabilitation self-efficacy may decline once physical therapy has started (e.g., Maddison et al., 2012). Further, investigating the effects of an imagery intervention that simulates autonomy-supportive consulting practices by giving choices on injury self-efficacy is important. At present, the effects of a multiple script imagery intervention with personal choice in type of imagery on the rehabilitation self-efficacy of athletes undergoing treatment has not yet been examined.

Conclusion

Based on the literature review above, there is evidence to support the use of imagery to enhance self-efficacy during athletic injury rehabilitation (e.g., Wesch et al., 2016). Imagery can act as a source of self-efficacy directly, through symbolic modeling, or indirectly, through increasing the amount of past performance successes, altering physical and emotional states, and acting as a source of verbal persuasion through self-talk (Bandura, 1977). Although self-efficacy can be enhanced in many different ways, imagery was chosen as the psychological skill in the present study due to the empirical support it has received to decrease perceptions of pain, improve the rate of healing, and decrease stress (Carrico et al., 2008; Cupal, 1998; Jones et al., 2014). Additionally, because many athletes already use imagery during practice and competition (Driediger et al., 2006), they may have some familiarity with the skill and find it easier to perform during injury rehabilitation compared to skills with which they are less familiar.

Self-efficacy is an important psychological factor in athletic recovery: researchers have found that people with higher self-efficacy experience greater adherence to rehabilitation, lower levels of perceived pain, and decreased stress levels (Guo et al., 2019; Milne et al., 2005; Somers et al., 2012). Additionally, the integrated model of sport injury rehabilitation holds that an athlete's cognitive appraisal of their injury, which depends on personal and situational factors including self-efficacy, influences their emotional and behavioral response to the injury (Wiese-Bjornstal et al., 1998). According to Wiese-Bjornstal et al. (1998), having high-self efficacy to cope with an injury will positively influence emotional and behavioral responses and therefore improve injury outcomes.

Additional experimental studies are important to study the effectiveness of mental skill modalities on self-efficacy during injury. Although multiple correlational studies support the positive relationship between imagery and self-efficacy during rehabilitation (e.g., Milne et al., 2005; Sordoni et al., 2002), more experimental studies are needed to possibly find a causation effect. Multiple baseline design is an effective way to detect subtle changes in participants' rehabilitation self-efficacy over time, assess the effects of imagery practice at different stages of rehabilitation, and provide sport psychology consultants and researchers with data that represents a real-world mental skill intervention.

Introduction

Sport-related injuries can have a negative effect on both physical and psychological functioning. Injured athletes may experience psychological consequences such as frustration, anger, feelings of loneliness, self-criticism, sleep disturbance, and trouble focusing (Von Rosen, Kottorp, et al., 2018). The manner in which athletes cope with their injuries can have an impact on their rehabilitation outcomes. As sport injuries remain commonplace, with an age adjusted rate of 34.1 per 1,000 population (Sheu et al., 2016), research is needed to examine supplemental psychological treatments to support athletes who sustain injuries.

Stress response models for athletic injury that illustrate the complex interactions between the factors influencing rehabilitation include the biopsychosocial model of sport injury rehabilitation (Brewer et al., 2002) and the integrated model of response to sport injury and rehabilitation (Wiese-Bjornstal et al., 1998). Proponents of the integrated model of response to sport injury and rehabilitation (Wiese-Bjornstal et al., 1998) view injuries as stressors requiring an athlete's cognitive appraisal, which is influenced by interactions between personal (e.g., psychological characteristics, injury history) and situational factors (e.g., accessibility to healthcare, sport type, playing status). Similarly, supporters of the biopsychosocial model of sport injury rehabilitation (Brewer et al., 2002) postulate that psychological factors can influence rehabilitation outcomes (e.g., rate of healing and return to sport, re-injury risk) directly (e.g., personality, affect, and behavior) and indirectly (e.g., social/contextual factors, biopsychological factors). In both models, an injured athlete's psychological factors (e.g., trait anxiety, self-confidence) play a prominent part in the rate, success, and enjoyment of the rehabilitation process. Additionally, both models imply the notion that psychological support during periods of injury could potentially improve recovery outcomes in athletes.

Self-efficacy, which refers to one's beliefs and expectations about their ability to execute a specific task or skill in a given environment, is a psychological factor capable of influencing injury recovery outcomes (Bandura, 1977). In regard to injury rehabilitation, individuals with higher levels of rehabilitation self-efficacy demonstrate better adherence to treatment protocols (Chen et al., 1999; Milne et al., 2005), greater likelihood of post-surgical locomotive recovery (Fortinsky et al., 2002), and heightened functional ability (Wylde et al., 2012) compared to their counterparts with lower levels of self-efficacy. Additionally, in the medical domain, higher levels of self-efficacy for healing are negatively correlated with perceptions of pain, stiffness, and fatigue (Somers et al., 2012) and athletes with higher self-efficacy may have a higher tolerance for stress (Guo et al., 2019). Because it is possible that rehabilitation self-efficacy could change over time within individuals, developing treatments capable of enhancing self-efficacy could have the potential to positively impact athletes' injury recovery process.

One psychological skill that may enhance self-efficacy is imagery. Imagery is the mental reproduction of an object, scene, or sensation as though it were occurring in reality and may be perceived based on experiences from the past or take place in the future (Driediger et al., 2006). In sports, imagery is a highly supported performance enhancing technique that has been demonstrated to improve motor skill acquisition and development, increase confidence and motivation, and regulate arousal and anxiety levels (Cumming & Williams, 2012; Ievleva & Orlick, 1991; Paivio, 1985), even in cases where imagery is only used one time (Cumming et al., 2004). Athletes most frequently use imagery before competition and during training (Driediger et al., 2006); however, researchers are also exploring its efficacy as a mental skill for enhancing athletic injury rehabilitation (e.g., Cupal & Brewer, 2001). Athletes interviewed during a qualitative study described using cognitive, pain management, healing, and motivational imagery throughout the rehabilitation process (Driediger et al., 2006). The researchers also explained how the aforementioned types of imagery used changed over time according to the stage of healing. Additionally, Cupal and Brewer (2001) conducted an intervention to examine the effects of imagery on physical outcomes of injury rehabilitation in athletes. Participants who received 10 sessions of guided imagery and relaxation over a six-month period during ACL rehabilitation demonstrated increased knee strength, lower re-injury anxiety, and less pain compared to participants in placebo and control groups. Subsequent research has supported these results with respect to physical healing indicators of range of motion and mobility related to the rehabilitation of stage II shoulder impingement (Hoyek et al., 2014) and increased muscular endurance related to grade II ankle sprains (Christakou et al., 2007).

Individuals who practice imagery during injury rehabilitation may experience psychological benefits in addition to physical benefits. According to Bandura (1977), imagery can increase self-efficacy through direct and indirect mechanisms. A direct way imagery purportedly influences self-efficacy is from vicarious experience, which can include live or symbolic modeling (Bandura, 1977). Symbolic modeling can involve a person seeing and feeling themself, or another person, perform a given task where imaging success can increase one's belief that they possess the capabilities to do so (Bandura, 1977). Imagery may also influence self-efficacy indirectly given that imagery can influence or be influenced by past performance accomplishments, verbal persuasion, and physical/emotional states, which are the other sources of self-efficacy (Bandura, 1977).

The existing body of empirical research on the relationship between imagery use and athletic injury rehabilitation self-efficacy is limited in number. Further, the majority of research is correlational in nature, which does not allow for cause-and-effect conclusions or control for potential confounding variables (e.g., Milne et al., 2005; Sordoni et al., 2002). In one example of an intervention study, Maddison et al. (2012) researched the effects of a guided healing imagery intervention on the self-efficacy of participants undergoing rehabilitation after having first-time ACL reconstructive surgery ($N = 21$). Interestingly, a decline in self-efficacy in both the experimental and control groups was observed at three time points over a nine-week study. At the end of the study, the experimental group experienced less of a decline in rehabilitation self-efficacy than the control group as measured by mean differences. Because these groups were relatively small in size and changes in self-efficacy may be subtle, mean differences between groups may not have captured the nuances of the intervention. Alternatively, Wesch et al. (2016) utilized a multiple-baseline single subject design to assess changes in task and coping self-efficacy in five participants who were scheduled to undergo surgery for a Type B malleolar fracture. In the context of injury rehabilitation, task efficacy refers to an individual's belief in their ability to perform a specific type of rehabilitation exercise, whereas coping efficacy includes an individual's belief in their ability to adhere to a physical therapy regime despite time constraints or personal challenges (Wesch et al., 2012). Wesch and colleagues (2016) administered two imagery intervention sessions and also provided participants with four different types of imagery recordings (cognitive, healing, pain management, and motivational imagery) to use at their selection on a daily basis. At the study's conclusion, two out of the five participants demonstrated an increase in task efficacy and three demonstrated an increase in coping efficacy. One strength of this study was giving participants the freedom to choose which imagery recording to listen to during rehabilitation; however, which types of imagery participants chose to listen to was not reported. Giving participants autonomy, one's sense of feeling in control of their choices, is in line with fulfilling one of three basic psychological needs that each person has according to the self-determination theory (Deci & Ryan, 2012). Giving choice or autonomy over time is also supported by earlier researchers, who suggested that personal preference and phase of rehabilitation play an important role in which type of imagery athletes prefer to use (Driediger et al., 2006; Evans et al., 2006). Because Wesch et al. (2016) conducted their study after participants received surgery but before commencing physical therapy, additional research is needed to test the effects of an imagery intervention on the task and coping self-efficacy of athletes *simultaneously* engaging in physical therapy, especially because self-efficacy for rehabilitation may be at risk for declining once physical therapy has started (e.g., Maddison et al., 2012). Further research is also needed to uncover which types of imagery participants choose to use and if certain types tend to be used more often overall or at different stages of the recovery process. At present, the effects of an imagery intervention utilizing personal choice in the type of imagery on the task and coping rehabilitation self-efficacy of athletes undergoing physical therapy treatment has yet to be examined. Competitive athletes were the selected population for the present study because they may have different cognitive appraisals and emotional reactions than non-athletes to injury (Wiese-Bjornstal et al., 1998) and tend to use imagery more frequently and perceive it as more relevant to their performance compared to recreational athletes (Cumming & Hall, 2002).

The purpose of the present study was to explore the effects of a multiple script option imagery intervention on task and coping self-efficacy during athletic injury rehabilitation. Because a single imagery education session has been demonstrated by researchers to increase long term-imagery use in athletes during competition and practice (Cumming et al., 2004), the present study utilized a single imagery education session with the lead researcher followed by structured rehabilitation imagery practice with options of listening to different guided imagery audio recordings. A single education session may be a practical and efficient way for professionals in the field of sport psychology and sport medicine to improve recovery outcomes in athletes. An intervention that allowed for autonomy by way of providing choice of different imagery scripts was implemented to encourage adherence to the six-week study. Specifically, in the present study, participants were given four imagery recordings pertaining to healing, rehabilitation process, motivational, and pain management imagery, and instructed to choose their preferred imagery type when they practiced. Participants were also asked to report which types of imagery they chose to practice each week, which allowed for novel insight into the preferences of athletes' imagery content. Similarly to Wesch et al. (2016), a multiple baseline design was used to assess for any subtle changes to rehabilitation self-efficacy over time, assess the influence of an imagery practice at different stages of rehabilitation, and provide sport psychology professionals with results that resemble working with an athlete in a consulting setting. Another benefit of a multiple baseline design is that it tells a more complete story of a participant's experience rather than testing mean differences at two or three time periods. n contrast to the design utilized by Wesch and colleagues (2016), in the present study, the intervention was given at different times *during* rehabilitation rather than *before* commencing rehabilitation. The ultimate purpose of the present study was to expand the field of research on the use of imagery during athletic injury rehabilitation and its effects on rehabilitation self-efficacy to provide mental performance consultants, sport medical professionals, and athletes with empirical information surrounding the relationship between imagery and self-efficacy.

Methods

Participants

The present sample consisted of 5 individuals (2 men, 3 women) ranging from 20-47 years old (M_{age} = 29.4; *SD* = 9.6), all of whom self-identified as athletes. Sport types included long-distance running and hiking (*n* = 3), soccer (*n* = 1), and downhill/endurance style mountain biking (*n* = 1). Participants reported currently competing at the varsity intercollegiate (*n* = 1), club intercollegiate (*n* = 1), and competitive adult (*n* = 3) levels. Years of participation in competitive sport ranged from 8-18 years (*M* = 12.6, *SD* = 4.3). Additionally, participants identified as White (*n* = 3), Latino/Caucasian (*n* = 1), and Asian (*n* = 1*)*. Participants were deemed eligible for the study if they were over the age of 18 years, diagnosed with an injury that was severe enough to require absence from sport for six or more weeks (excluding head injuries[1]), were actively attending physical therapy for at least four more weeks at the time of initial contact with the researcher, had not previously experienced the same injury to the same body part, participated in organized or semi-structured sporting events in the past year and planned to return after rehabilitation, had not previously practiced guided imagery related to injury rehabilitation, and were able to use a smartphone or access the internet on a daily basis (see Appendix B for inclusion criteria). Injuries reported in the present study included a progressive flat foot disorder (*n* = 1), a torn lateral collateral ligament (*n* = 1), a tibial plateau fracture (*n* = 1), a torn meniscus (*n* = 1), and a torn medial patellofemoral ligament (*n* = 1). See Table 1 for demographic variables grouped by participant. All five participants reported the aforementioned injury was preventing them from competing in their preferred sport. Regarding

[1] Athletes with head injuries were excluded due to the complex healing demands that occur with brain injury (Stokes & Hampton, 2019) and the potential contraindications associated with performing a cognitive intervention during brain healing (Willer & Leddy, 2006).

athletic injury history, three participants reported receiving physical therapy for a different sport-related injury in the past and two reported no previous history of physical therapy for a sport-related injury. Regarding history of imagery use, two participants reported practicing sport performance imagery and relaxation imagery before competitions in the past; however, none reported previous use of imagery related to injury rehabilitation. All five participants received physical therapy care in the Pacific Northwest region of the United States: two athletes worked with the same physical therapist during their rehabilitation and the other three athletes each worked with different physical therapists in the region.

Table 1.

Participant Demographic Variables

Participant	Age (years)	Current Level of Competition	Gender Identity	Injury	Length of sport participation (years)
A	22	Club Intercollegiate	Female	Torn Medial Patellofemoral Ligament	8
B	31	Adult	Male	Tibial Plateau Fracture	9
C	47	Adult	Male	Torn Meniscus	16
D	27	Adult	Female	Progressive Flat Foot Disorder	12
E	20	Varsity Intercollegiate	Female	Torn Lateral Collateral Ligament (LCL)	16

Measurements

Demographic Variables

Demographic data were gathered at a single time point immediately after the informed consent was signed by the participant. Data collected included age, sport, sport level and years of experience, gender identity, race/ethnicity, injury information, and previous physical therapy history (see Appendix C).

Athletic Imagery Injury Questionnaire (AIIQ-3)

Athletes' imagery use during injury rehabilitation was evaluated using the AIIQ-3 (see Appendix D), which consists of 16 items that reflect a combination of imagery content and function (Wesch et al., 2016). The AIIQ-3, an update from the original scale (see Sordoni et al., 2002), contains four independent subscales assessing the use of different imagery types: healing, pain management, cognitive, and motivational (Wesch et al., 2016). For example, items assessing pain management imagery use include, "During my rehabilitation, I imagine my pain resolving" and, "To distract myself from the pain associated with my injury, I use imagery" (Wesch et al., 2016). Participants rate their responses on a 9-point Likert scale from 1 (*never)* to 9 (*always*) to indicate their frequency of use of each type of imagery (Wesch et al., 2016). Athletes' imagery use was assessed by averaging items from each subscale. Wesch et al. (2016) reported high construct validity. Additionally, reliability of the AIIQ-3 was supported by Cronbach alpha coefficients of .86 for cognitive imagery, .82 for motivational imagery, .91 for healing imagery, and .82 for pain management imagery (Wesch et al., 2016). The AIIQ-3 has sound psychometric properties: CFI = .92, RMSEA = .09 (Wesch et al., 2016). The AIIQ-3 was used as a manipulation check to assess participants' imagery use during the baseline and treatment phases. In the current study, the Cronbach alpha coefficient was .97.

Athletic Injury Self-Efficacy Questionnaire (AISEQ)

To assess self-efficacy during the injury rehabilitation process, the AISEQ (see Appendix E) was administered. The assessment includes seven items representing task and coping self-efficacy, which are measured with a 100% confidence scale ranging from 0% (*no confidence*) to 100% (*completely confident*) for each item (Milne et al., 2005). Task and coping self-efficacy were scored by averaging items from each subscale. An example task item is, "I am confident that I can perform all of the required rehabilitation exercises" and an example coping item is, "I am confident that I can do my rehabilitation exercises when I am in a bad mood" (Milne et al., 2005). Cronbach alpha coefficients of .81 for task efficacy and .80 for coping efficacy support the reliability of the AISEQ (Milne et al., 2005). The AISEQ also has sound psychometric properties: AGFI = .94, CFI = .98, RMSEA = .06 (Milne et al., 2005). In the current study, the Cronbach alpha coefficient was .96 for task efficacy and .92 for coping efficacy.

Rehabilitation Progress Rating

To assess participants' perceptions of their progress in physical therapy, a weekly scale was administered on Qualtrics (see Appendix F). Participants were asked about their satisfaction with their rehabilitation progress in the past week and were asked to rate their progress on a scale from 1 (*very dissatisfied*) to 10 (*highly satisfied*). Results were used to potentially explain outcomes regarding changes in self-efficacy over time.

Social Validation – Imagery Logbook

Participants were assigned a weekly logbook to elicit their perception of the imagery intervention. The content of the logbook (see Appendix G) was used to measure the amount and type of imagery used, assess participants' perception of the intervention, and help detect potential extraneous variables that may account for observed changes in self-efficacy (Page & Thelwell, 2013).

Post-Intervention Survey

After completing the 6-week research study, participants were given a post-intervention survey to assess their thoughts and perceptions of the imagery intervention, their perceived ability to perform imagery, and any final comments or suggestions for improvement (see Appendix H). Additionally, an item from the revised Vividness of Movement Imagery Questionnaire was adapted to assess participants' use of different imagery perspectives (Roberts et al., 2008). Responses from the post-intervention survey were used to supplement results from the visual analyses and potentially explain outcomes.

Procedure

Participant Recruitment

Following institutional ethics approval, a convenience sample of athletes were recruited through known contacts until five participants completed the 6-week study. Personal and professional contacts who were aware of the study shared the recruitment flyer (see Appendix I) with injured athletes, who were not direct personal contacts of the lead researcher. The lead researcher also instructed secondary parties to refrain from providing any details about the study and to avoid inquiring about the study after handing out the flyer. If contacted by the athlete, the lead researcher subsequently screened the prospective participant for inclusion criteria via telephone. Potential participants were also notified they would receive a $75 Amazon gift card upon completion of the research study. A recruitment script was used to standardize the explanation of the study (see Appendix B). Participants who agreed to enroll in the study were immediately sent the informed consent (see Appendix J), demographic questionnaire, and baseline surveys online via Qualtrics software.

Data Collection

All surveys were administered via Qualtrics online software A multiple baseline design was used to analyze changes in the task and coping self-efficacy of each participant over the course of the 6-week study. The AIIQ-3 was administered upon study enrollment, right before the imagery education session, after the imagery education session, and at the conclusion of the study for each participant. The AISEQ was administered three times per week on Mondays, Wednesdays, and Fridays over the course of the study. In addition, participants completed the rehabilitation progress rating on a weekly basis throughout the study by using a scale that ranged from 1 (*very dissatisfied*) to 10 (*highly satisfied*). In line with Kratochwill et al.'s (2010) criteria for single subject experimental design, participants completed the AISEQ a minimum of five times before receiving the imagery education session and a minimum of five times after the imagery education session during the imagery treatment phase to measure changes in task and coping self-efficacy during injury rehabilitation (see Appendix K for a sample timeline). Further, due to the nature of a multiple baseline design, participants were scheduled to receive the imagery education session, and therefore begin the imagery treatment phase of the study, at different time points. Participant A, B, C, D, and E received the imagery education session after completing the AISEQ five, seven, nine, eleven, and thirteen times, respectively (see Appendix L for data collection procedure). After completing the education session and starting the treatment phase, participants completed the weekly imagery logbook. The one-on-one education session took place via Zoom video conferencing platform two to five weeks following the initial contact phone call and lasted approximately 25 minutes. Zoom was used to increase access of participants to the study. The researcher used a standard script for the educational imagery session (see Appendix M), with the addition of a question-and-answer portion. The post-intervention questionnaire was given to participants on the final day of their 6-week study.

Imagery Education Session

During the imagery education session, participants were introduced to imagery as an evidenced based mental skill and informed of the potential benefits of performing imagery during injury rehabilitation. Four types of rehabilitation imagery (healing, pain management, rehabilitation process, and performance) were explained during the second half of the meeting and participants were provided audio files via email containing four different scripts for each function of imagery. Imagery scripts were written and recorded by the lead researcher (see Appendix N for scripts). All guided imagery recordings were polysensory in nature, guided listeners to use either internal or external first-person imagery and contained phrases describing positive coping responses. Because participants had different types of injuries, scripts contained general physiology and sport references (e.g., imagining blood flowing to an injured area or making a full return to competition) and participants were encouraged to tailor the imagery specific to their injury and sport. The length of the recordings ranged from seven to ten minutes to increase adherence to the intervention and keep sessions at a manageable length. Participants were encouraged to listen to all four scripts during the treatment phase but were ultimately given autonomy to choose which imagery recording(s) to listen to and encouraged to use the one they felt best met their needs at the time. Participants were asked to practice guided imagery 4 times/week for the next 2-4 weeks, depending on what time the treatment phase began. Participants were encouraged to leave reminders to practice imagery in places they saw daily (i.e., bathroom mirror, nightstand) to assist in habit formation. During the imagery education session, the researcher also explained that participants would be asked to complete an imagery logbook on a weekly basis via Qualtrics to assess their experience practicing imagery.

Data Analysis

Manipulation check

Data gathered from the AIIQ-3 was used to calculate descriptive analyses (including mean and standard deviation) on the baseline and treatment phase data. The manipulation check was done to assess whether the imagery intervention resulted in changes in imagery use by athletes. The AIIQ-3 data was supplemented with answers received from the weekly logbook and the rehabilitation progress rating, both of which also served to help identify potential extraneous variables.

Intervention effects

Visual analysis was used to examine potential treatment effects of the imagery intervention on rehabilitation self-efficacy. In line with Wesch et al. (2016), task and coping rehabilitation efficacy data were examined independently, both within and across the baseline and treatment phases for each participant. The graphically displayed data was analyzed with respect to features including level, variability, trendline, and immediacy of effect (Byiers et al., 2012). Level refers to the average rate of dependent variables in a phase. Changes in level were assessed by comparing the amount of overlap in data between the baseline and treatment phases where less overlap between the phases indicated a greater change in level (Byiers et al., 2012). Percentage of non-overlapping data points (PND), which represent the percent of responses in the treatment condition that are more extreme than the most extreme values in the baseline condition, were calculated as a way to quantify changes in level and effect size (Scruggs et al., 1987). A PND in the positive direction (PNDP) represented the percent of responses in the treatment phase that were higher than the highest value in the baseline phase, whereas a PND in the negative direction (PNDN) represented the percent of responses in the treatment phase that were lower than the lowest value in the baseline phase. Variability refers to changes in stability over time and was evaluated by comparing minimum and maximum data points in the baseline phase to the minimum and maximum data points in the treatment phase (Byiers et al., 2012). If the difference between minimum and maximum data points changed from one phase to the next, it was determined that a change in variability had occurred. Trendlines indicate changes in the direction of data points over time and were assessed by inspecting the direction of the data points during the baseline and treatment phases (Byiers et al., 2012). For example, if data points were trending in one direction during the baseline phase and trending in a different direction during the treatment phase, it was determined that a change in trendline occurred. Moreover, if there was no observable trendline during one phase and the other phase did have an observable trendline, it was also determined that a change in trendline occurred. Lastly, immediacy of effect refers to the amount of time elapsed between the intervention and when changes in the dependent variable were observed (Byiers et al., 2012). Immediacy of effect was assessed through visual analysis of the timing of when changes in the dependent variable occurred: if there was a delay from the beginning of the treatment phase to when changes in the dependent variable occurred, it was considered latency of effect (Byiers et al., 2012). A latency effect indicated factors outside of the control of the research study that may have influenced the dependent variable and, therefore, may provide evidence for noneffect; it was also possible that a latency could be due to a delay in the time it takes for the treatment effect to produce change or that multiple sessions of imagery are needed to change rehabilitation self-efficacy levels. In contrast, if the change in the dependent variable was observed shortly after the onset of the treatment phase, it was considered evidence for treatment effect. To supplement visual analyses, descriptive statistics were calculated and presented on the data collected from each participant, including calculation of mean and standard deviation of task and coping self-efficacy scores for the baseline and treatment phases.

In addition to visual analysis of the rehabilitation task and coping self-efficacy data, content from the logbooks, rehabilitation progress rating, and final survey was used as supplementary evidence that the intervention was functionally related or unrelated to a change in outcome and to help rule out the potential for extraneous variables (Page & Thelwell, 2013). For example, if a participant reported that an outside factor affected their physical therapy treatment and/or rehabilitation progress, it was considered when assessing changes in the dependent variable. Additionally, participants' feelings, thoughts, and perceptions of the imagery practice were compared to the dependent variable and analyzed with both objective and subjective data taken into consideration.

Results

Manipulation Check

See Table 2 for a summary of participants' weekly imagery practice, results from the AIIQ-3, and rehabilitation progress rating means and standard deviations. Weekly imagery logbooks indicated that participants adhered to the intervention. Participants listened to healing imagery most often, pain management imagery the second most often, and both rehabilitation process and sport performance imagery the least often. Results from the AIIQ-3 indicate participants practiced imagery during the baseline and treatment phases of the study.

Individual Task Efficacy, Coping Efficacy, Weekly Imagery Logbooks and Post-Intervention Surveys

Participant A

See Figure 1 for participant A's rehabilitation self-efficacy data. Visual analysis of task efficacy indicated an increase in level from the baseline phase to the treatment phase. This finding is further supported by a PNDP of 92.3, which indicates that 92.3% of the data points in the treatment phase were higher than the highest data point in the baseline phase. The PNDN was 0. The effect of the imagery education session appears immediate as there was minimal delay in the increase in level after the imagery education session. Negligible changes in variability were observed as the difference between minimum and maximum values during the baseline phase was 6.3 and 7.7 during the treatment phase. Further, no changes in trendline were observed either within or across the baseline and treatment phases. Taken together, the increase in level and the high PNDP indicate an increase in Participant A's task efficacy during the treatment phase.

Table 2

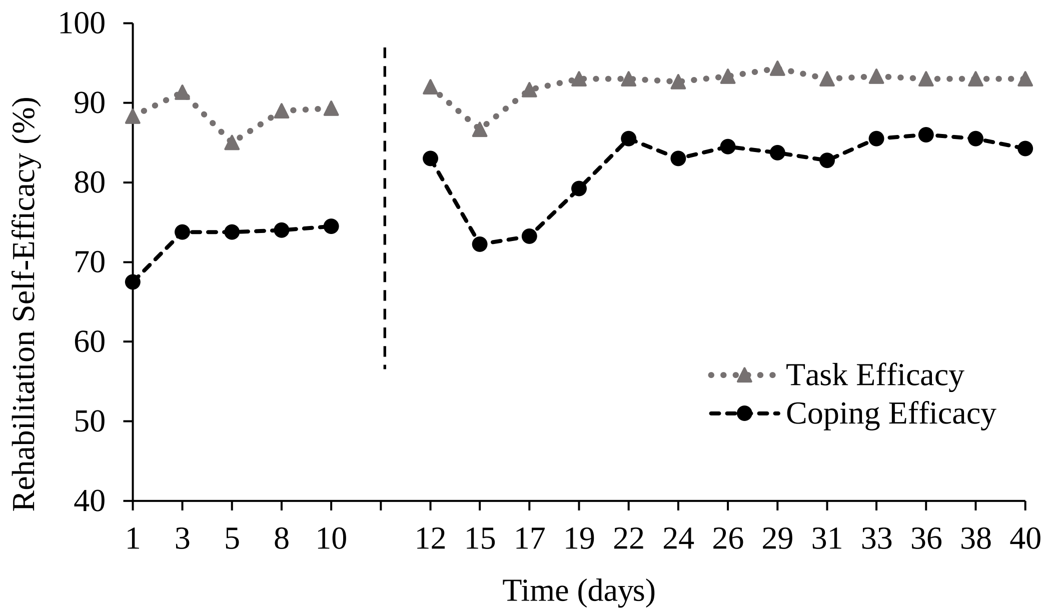
Manipulation Check: Weekly Imagery Logbook, Athletic Injury Imagery Questionnaire-3 (AIIQ-3, and Rehabilitation Progress Rating

Participant	A	B	C	D	E
Time in Treatment Phase (weeks)	4.3	3.6	3.0	2.3	1.6
Total # of Reported Imagery Sessions	12	11	9	6	4
Healing	7	4	9	2	4
Pain Management	3	1	0	2	0
Rehabilitation Process	1	3	0	1	0
Sport Performance	1	3	0	1	0
Mean Imagery Use (AIIQ-3)					
Baseline Phase (*SD*)	1.4 (*0.6*)	7.3 (*1.3*)	6.8 (*3.1*)	6.7 (*1.3*)	7.3 (*1.4*)
Treatment Phase (*SD*)	1.9 (*0.9*)	8.2 (*0.8*)	5.8 (*2.6*)	6.5 (*0.9*)	8.1 (*0.7*)
Mean Rehabilitation Progress Rating					
Baseline Phase (*SD*)	5.5 (*.7*)	9 (*0.0*)	5.33 (*1.2*)	6.75 (*0.5*)	8 (*1.4*)
Treatment Phase (*SD*)	7.5 (*0.6*)	9.5 (*1.0*)	8.33 (*1.2*)	7 (*0.0*)	7 (*0.0*)

Participant A's coping efficacy data shows an increase in level, which is further supported by a PNDP of 85. The trendline data was stable during the baseline phase and positive during the treatment phase. There is an observed immediacy of effect immediately after the imagery education session, which was followed by a return towards baseline coping efficacy levels at the next time interval and then followed by an increase in coping efficacy levels for the remaining duration of the treatment phase. The variability was greater in the treatment phase compared to the baseline phase as the difference between the minimum and maximum values was 13.75 during the treatment phase and only 7 during the baseline phase. The PNDN was 0. The increase in level, which is supported by a large PNDP, and the change in trendline from the baseline to the treatment phase provided evidence to support an increase in coping efficacy during the treatment phase.

Figure 1

Mean Task and Coping Self-Efficacy of Participant A



Note. Time represents days since the participant began the study. The dotted line in the middle of the graph represents the imagery education session and therefore seperates the baseline and treatment phases.

Participant A reported practicing imagery three times per week and did not disclose any outside factors affecting their rehabilitation progress or ability to practice imagery. Participant A described that practicing imagery "helped view [their] injury in a more positive way and accept [their] knee is different, increased hope about recovery, reduced anxiety during flare-up." Participant A reported imagery influenced their rehabilitation progress for the first three weeks of the treatment phase and they were unsure about its effect for the last week of the treatment phase. Additionally, participant A reported using an equal combination of internal and external imagery and felt that re-creating the images described in the imagery recordings was easy. Participant A's response to the imagery recordings were, "…I liked being able to choose from the different kinds [of recordings] depending on how I was feeling…I felt like it was a very positive way to view my injury when prior to using these recordings I had a very negative perception of my injury."

Participant B

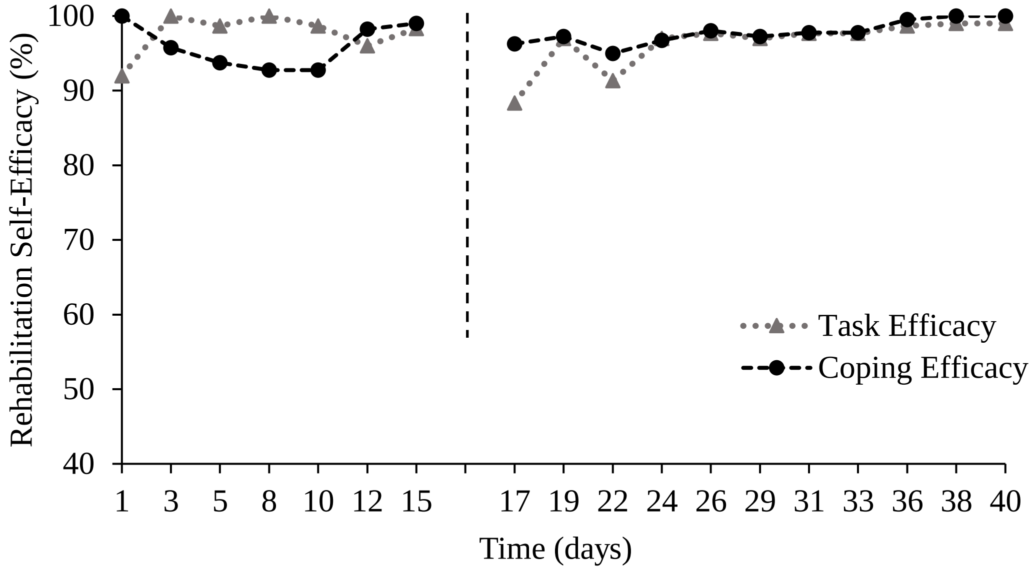
See Figure 2 for participant B's rehabilitation self-efficacy data. Visual analysis of task efficacy indicated no notable changes in level as there were a high degree of overlapping data points between the baseline and treatment phases. The PNDP was 0 and the PNDN was 18. Visual analysis indicated no observable changes in trendline. The variability of task efficacy was 8 during baseline phase and 10.7 during the treatment phase, indicating minimal change in variability between the phases. After the imagery education session, there was an immediate decrease in task efficacy followed by a gradual increase towards baseline levels. Although there was a short-term increase in variability and immediacy effect after the education session, because self-efficacy returned to baseline levels by the end of the treatment phase, it was determined that there was no effect of the imagery intervention on task efficacy.

Coping efficacy data for participant B indicated no changes in level because there was a high degree of overlapping data points in the baseline and treatment phases. The PNDP and PNDN were both 0. Changes in variability within and between the baseline and treatment phases were also negligible: baseline phase variability was 7.25 and treatment phase variability was 5. The trendline was overall negative during the baseline phase and positive during the treatment phase; however, the trendline started to become positive during the last week of the baseline phase, which provides evidence that the change in trendline may have been due to an extraneous variable. No immediacy of effect was observed with respect to the imagery education session. Because there was a lack of increase in level and a positive trendline present during the end of the baseline phase, it was determined that the imagery intervention did not have an effect on participant B's coping efficacy.

Participant B reported using a combination of imagery types during the treatment phase and practiced imagery three to four times per week. For all three weeks of the treatment phase, participant B reported that imagery influenced their rehabilitation progress, stating they were "more excited about returning to sport, [had an] improved attitude about rehab and confidence related to sport-specific movements during rehab." Participant B reported no outside factors affected their ability to attend physical therapy or practice imagery during the treatment phase. Participant B reported they felt it was very easy to re-create the images described in the imagery recordings and felt they were "helpful in increasing confidence and hope for full recovery." Participant B used an even combination of internal and external imagery during the treatment phase.

Figure 2

Mean Task and Coping Self-Efficacy of Participant B



Note. Time represents days since the participant began the study. The dotted line in the middle of the graph represents the imagery education session and therefore seperates the baseline and treatment phases.

Participant C

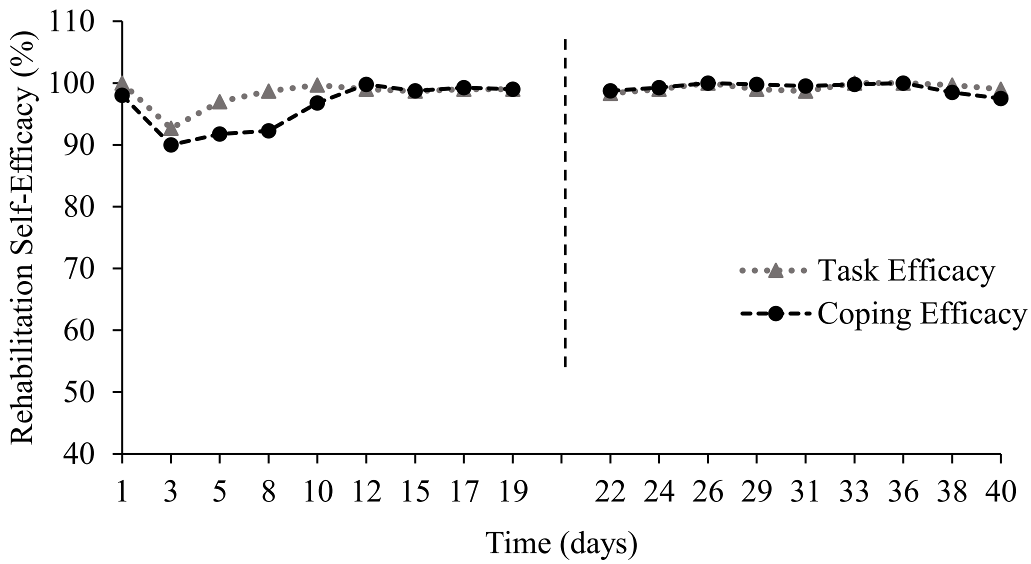
Visual analysis of the task efficacy data collected from Participant C (see Figure 3 for rehabilitation self-efficacy data) revealed no marked changes in level and no immediacy effect. The PNDP and PNDN were both 0. There was an observed decrease in variability: during the baseline phase, the difference between the minimum and maximum values was 7.3 and during the treatment phase the difference was 1.7. However, the variability during the baseline phase occurred during the first week and stabilized before the treatment phase began, which may indicate the presence of an extraneous variable during the beginning of the baseline phase. There were no observed changes in trendline. In sum, the lack of change in level and trendline as well as the decrease in variability during the latter part of the baseline phase indicated that the imagery intervention did not have an effect on the task efficacy of participant C.

Visual analysis of coping efficacy does not show marked changes in level due to the presence of a high degree of overlapping data points between the baseline and treatment phases. The PNDP was 22.2, with 22.2% of the data points in the treatment phase higher than the baseline phase. The PNDN was 0. The trendline was positive during the beginning of the baseline phase and stable during the latter half of the baseline phase and during the treatment phase, so there was no observed immediacy effect. The variability was 9.75 during the baseline phase and 2.5 during the treatment phase, indicating that variability was higher during the baseline phase. Taken together, the lack of change in level and the stable trendline during the baseline to treatment phase indicated that the imagery intervention did not have an effect on participant C's coping efficacy.

Participant C reported practicing healing imagery three times per week during the treatment phase. Participant C reported that imagery did not influence their rehabilitation progress for the first two weeks of the treatment phase, stating: "[They] haven't noticed any difference" and reported feeling unsure if imagery had an effect during the last week. Participant C reported no outside factors affected their ability to practice imagery or perform rehabilitation exercises. Participant C reported using internal imagery only and described that it was difficult to create the images in the recordings. When asked about their perception of the imagery recordings, they stated, "I think it could possibly work, I am not sure it worked for me. It's hard to tell, it could have worked, I am walking now!"

Figure 3

Mean Task and Coping Self-Efficacy of Participant C



Note. Time represents days since the participant began the study. The dotted line in the middle of the graph represents the imagery education session and therefore seperates the baseline and treatment phases.

Participant D

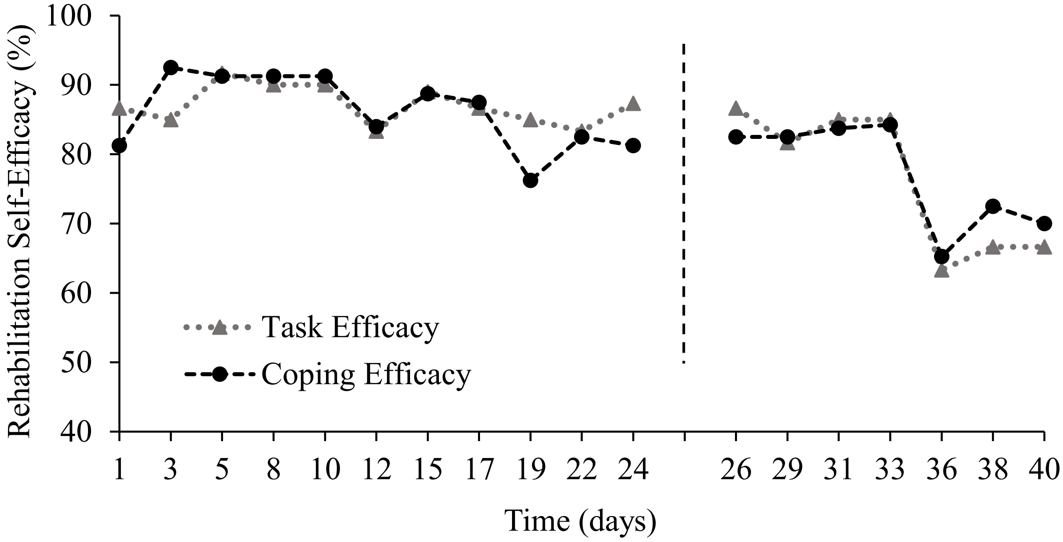
See Figure 4 for participant D's rehabilitation self-efficacy data. Visual analysis of participant D's task efficacy data indicates a decrease in level from the baseline to the treatment phase; however, there appears to be a delayed latency to change, which could indicate no effect. The PNDP was 0 and PNDN was 57, with 57% of the treatment phase data points below the baseline. The variability increased from the baseline to the treatment phases: during baseline phase, the variability was 8.3 and during the treatment phase the variability was 23.3. Because the increase in variability occurs during the latter part of the treatment phase without immediacy, it is likely that the effect is due to an extraneous variable. The trendline changed from being stable during the baseline phase to being negative during the treatment phase. In sum, results indicate that the task efficacy of participant D decreased during the treatment phase; however, the latency to change with respect to the decrease in level, trendline, and increase in variability indicate the presence of an extraneous variable.

Visual analysis of the coping efficacy of participant D indicated a decrease in level during the study. The PNDP was 0 and the PNDN was 43, with 43% of the treatment phase data points below the baseline. The variability was similar during the baseline and treatment phases: the difference between the minimum and maximum values was 16.25 during the baseline phase and 19 during the treatment phase. Additionally, the trendline was negative during both the baseline and treatment phases, which could indicate the presence of an extraneous variable. No immediacy effects were observed after the imagery education session. Taken together, the decrease in level, the lack of change in variability, and the negative trendline in the baseline and treatment phases indicate the imagery intervention did not affect participant D's coping efficacy.

Participant D stated that they were unsure if the imagery influenced their rehabilitation during both weeks of the treatment phase, stating "Not enough time to tell" and "My injury is very swollen and it's hard to get much movement in the area" when prompted to explain their answer. Participant D also reported a significant cast removal event during week 2 of the treatment phase: "…Looking at…all the incisions make it seem like I'm never going to be able to run…Even just standing seems like it will take me an eternity." Participant D reported liking the imagery audio files and used both internal and external imagery but used internal imagery more than external. Participant D also reported occasional difficulty staying focused during the imagery sessions because they were used to doing imagery while on training runs, so practicing in a seated position was novel to them.

Figure 4

Mean Task and Coping Self-Efficacy of Participant D



Note. Time represents days since the participant began the study. The dotted line in the middle of the graph represents the imagery education session and therefore seperates the baseline and treatment phases.

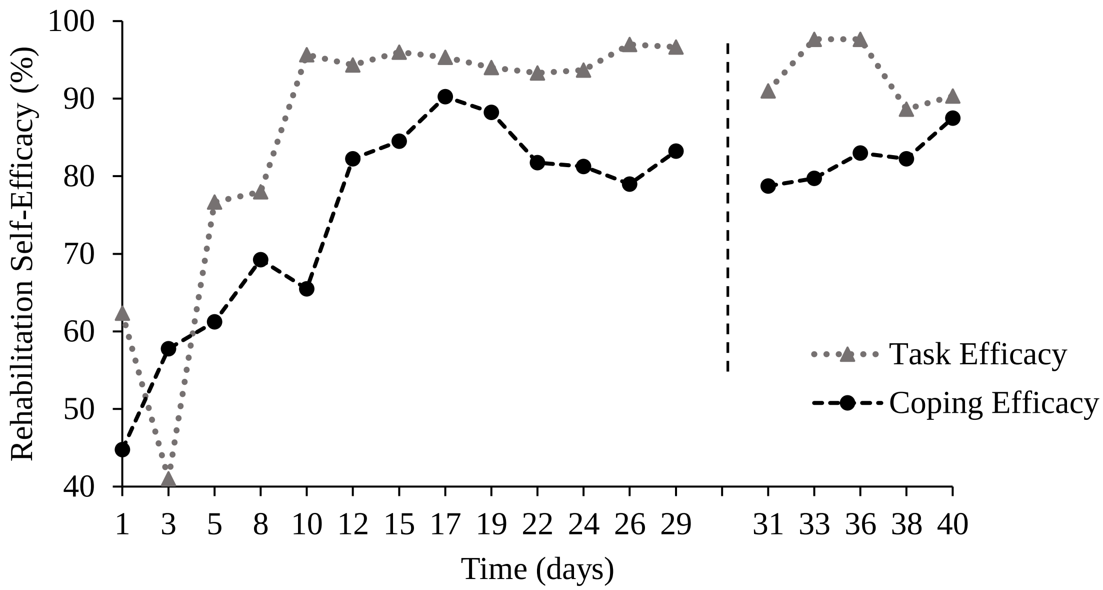
Participant E

Visual analysis of participant E's task efficacy data (see Figure 5 for rehabilitation self-efficacy data) indicated a moderate increase in level from the baseline to the treatment phases as there were a moderate degree of overlapping data points between the baseline and treatment phases. Additionally, the PNDP was 40, which indicates that 40% of the data points in the treatment phase were higher than the highest data point in the baseline phase. The PNDN was 0. During the baseline phase, the variability was 56 and during the treatment phase the variability was 9, indicating that variability decreased from the baseline to treatment phases. However, in the earlier stages of the baseline phase, data trends in the positive direction (i.e., higher task efficacy) and decreases in variability, which indicates the potential presence of an extraneous variable. The trendline appeared to increase during the baseline phase and increased and decreased during the treatment phase; however, no immediacy of effect was present. Although there is an observed increase in level during the treatment phase indicating that task efficacy increased, the positive trendline during the baseline phase and the decrease in variability before the treatment phase indicate that the imagery education session did not have an effect on the task efficacy of participant E.

Coping efficacy data for participant E showed no pronounced changes in level. The PNDP and PNDN were both 0. The trendline was positive during both the baseline and treatment phases, with a shorter downward trend during part of the baseline phase, which could indicate the presence of an extraneous variable(s) because the trendline was vacillated from positive to negative to positive before commencement of the treatment phase. The variability of the coping efficacy data was higher in the baseline phase compared to the treatment phase, with differences in variability of 45.5 and 8, respectively. However, the change in variability could also be a result of more data points in the baseline phase and there was also a lack of immediacy effects after the imagery education session. In sum, the PNDP of 0 and the positive trendline during the baseline phase outweigh the decrease in variability during the treatment phase and the PNDN of 0 and therefore indicate the imagery intervention did not affect the coping efficacy of participant E.

Figure 5

Mean Task and Coping Self-Efficacy of Participant E



Note. Time represents days since the participant began the study. The dotted line in the middle of the graph represents the imagery education session and therefore seperates the baseline and treatment phases.

Participant E reported practicing healing imagery one to three times per week over the course of the treatment phase. During the treatment phase, participant E disclosed traveling to team competitions and contracting the flu impeded their ability to practice imagery as frequently as they would have liked. Participant E was unsure if imagery had an effect on their rehabilitation progress during the first week of the treatment phase and felt imagery had a positive effect during the second week by helping overcome negative thoughts. Additionally, participant E reported using both internal and external imagery but used more internal than external. Participant E disclosed the imagery was easy to recreate in their mind, but that they occasionally became distracted during the practice. Further, participant E stated: "Thinking positively created a positive action towards my physical ability, which was beneficial for my mental state. Overall…it helped me mentally and physically to overcome hard moments in my life. I will also continue to practice these concepts within the rest of my process of recovery."

Rehabilitation Self-Efficacy Averages

See Table 3 for participants' task, coping, and rehabilitation self-efficacy means and standard deviations.

Cumulative Results

Considering all of the datasets together as seen in Appendices O and P, the multiple script option imagery intervention appears to have had either no effect or helped maintain task and coping self-efficacy at stable levels. Additionally, the imagery intervention employed in the present study did not buffer against significant injury or illness events. In review of the imagery logbook content as a whole, 100% of the comments regarding the imagery intervention were positive or skewed positive.

Discussion

The purpose of the present study was to examine the effects of a multimodal, autonomy-promoting imagery intervention on the rehabilitation self-efficacy of injured athletes who were sidelined from sport and participating in physical therapy for a minimum of four weeks. Only one participant (participant A) experienced an increase in task and coping self-efficacy after the imagery education session. In contrast, data obtained from the other four participants did not indicate changes in rehabilitation self-efficacy as a direct result of the imagery education session and subsequent treatment phase. Overall, the multiple script option imagery intervention either had no effect or helped maintain task and coping self-efficacy at stable levels in the present study.

Table 3

Rehabilitation Self-Efficacy Means and Standard Deviations

Participant	A	B	C	D	E	Group
Task Efficacy Means (*SD*)						
Baseline Phase	88.6 (2.3)	97.7 (2.8)	98.2 (2.23)	87.1 (2.8)	85.7 (17.1)	90.7 (*11.2*)
Treatment Phase	92.5 (1.9)	96.4 (3.4)	99.3 (*.63*)	76.4 (10.3)	93.1 (4.3)	92.4 (*9.2*)
Coping Efficacy Means (*SD*)						
Baseline Phase	72.7 (2.9)	96 (3.1)	96.2 (3.8)	86.2 (5.4)	74.5 (13.7)	84.8 (*14.9*)
Treatment Phase	82.2 (4.5)	97.8 (1.6)	99.2 (.83)	77.3 (7.8)	82.3 (3.4)	88.6 (*11.4*)
Total Rehabilitation Self-Efficacy Means (*SD*)						
Baseline Phase	79.5 (*9.7*)	96.7 (*4.3*)	97 (*4.6)*	86.6 (*6.0*)	79.3 (*19.2*)	87.4 (*13.8*)
Treatment Phase	86.6 (*7.1*)	97.2 (*4.6*)	99.3 (*1.1*)	76.9 (*10.1*)	86.9 (*12.8*)	90.2 (*10.7*)

At first glance, results from the present study seem to contradict Bandura's (1977) self-efficacy theory as well as the existing body of literature supporting the relationship between imagery and self-efficacy in the athletic injury rehabilitation domain (Cupal & Brewer, 2001; Maddison et al., 2012; Wesch et al., 2016). However, a closer examination of the data collected from each participant provides multiple explanations as to why the imagery education session failed to elicit notable increases in rehabilitation self-efficacy for most participants in the present study.

A potential factor in the present study was a ceiling effect on rehabilitation self-efficacy. All five participants had mean task efficacy scores over 85% and three out of five had mean coping efficacy scores over 85%, with all five participants having coping efficacy scores over

71% during the baseline phase of the study. Because rehabilitation self-efficacy was already high for many of the participants at the inception of the study, detecting a noticeable increase in task or coping self-efficacy during the treatment phase of the study would require mean averages to near 100%, which would be unexpected given that none of the participants had experienced the same injury in the past. When looking at the results through the lens of the integrated model of response to sport injury and rehabilitation (Wiese-Bjornstal et al., 1998), participants' cognitive appraisal of their injury could have contributed to their high rehabilitation self-efficacy scores during the baseline period. Because the present study examined the effects of an imagery intervention on injured athletes who are still planning on competing in sport, it is possible that their rehabilitation self-efficacy was higher than expected during the baseline phase because their discipline and work ethic (personality factors) required to be a competitive athlete as an adult influenced their perceptions of rehabilitation as an athletic challenge rather than a threat to their self-efficacy (cognitive appraisal) prior to the study (Brewer et al., 2002). Additionally, athletes in the present study also had access to consistent physical therapy treatment (situational or environmental factor), which could have contributed to their belief in their ability to successfully adhere to their rehabilitation program and return to sport (Brewer et al., 2002). Utilizing a similar research design, Wesch and colleagues (2016) recruited physically active adults who did not necessarily identify as athletes or compete in sport and found that multiple participants' task and coping self-efficacy increased after an imagery intervention. It is plausible that the differences in personal, situational, and environmental factors of competitive athletes (present study), versus physically active adults (Wesch et al., 2016), contributed to the differences in the effects of an imagery education session on rehabilitation self-efficacy.

Although results from the present study did not indicate that imagery causes consistent increases in rehabilitation self-efficacy, it is possible that the imagery practice prevented rehabilitation self-efficacy from dropping in most participants. When Maddison and colleagues (2012) researched the effects of a 24-week imagery intervention on injured athletes undergoing ACL reconstruction, they found that rehabilitation self-efficacy, measured as a single construct in this study, decreased over time, but less so in the group who received an imagery intervention compared to the control group. Researchers speculated that athletes may believe the rehabilitation process will be easier than it actually is and therefore have a stronger belief in their ability to rehabilitate their injury in the earlier stages of recovery compared to the later stages. In the present study, only three PNDN were observed: task efficacy PNDN for participant B was 18, task efficacy PNDN for participant D was 57, and coping efficacy PNDN for participant D was 43. Other PNDN scores were zero; this indicates minimal decline in participants' rehabilitation self-efficacy during the treatment phase compared to the baseline phase. Furthermore, participant D was the only one who had a negative task and coping efficacy trendline during the treatment phase. Participant D reported having their cast removed (during the second week of the treatment phase) was an extremely negative experience as it was the first time they saw their foot post-surgery and it caused them to fully realize the severity of the injury. Participant D's cast removal was likely the catalyst for the observed decline in task and coping self-efficacy and for the high PNDN during the treatment phase. Because participant D only had 2.3 weeks in the treatment phase, there was not enough time to observe the effects of the imagery intervention as they would have been masked by the negative cast removal event. Overall, only one participant in the present study experienced a decrease in both task and coping self-efficacy during the treatment phase therefore, results indicated that the imagery education session and imagery practice may have protected against a reduction in rehabilitation task and coping self-efficacy during rehabilitation for most participants. In sum, it is possible that rehabilitation imagery may act as a buffer against the decline in task and coping self-efficacy that can occur in athletes during the rehabilitation process (Maddison et al., 2012)

Another potential reason that rehabilitation self-efficacy did not increase for the majority of participants lies in the results from the manipulation check. Results from the AIIQ-3 were higher than expected during the baseline phase; this likely indicates that participants were already using some type of athletic injury imagery before receiving the imagery intervention, even though participants were not doing imagery formally or maybe even intentionally based on their answers to inclusion criteria. Introducing a formal imagery practice during the treatment phase may not have had a significant effect on rehabilitation self-efficacy if participants were already performing some amount of athletic injury imagery during the baseline phase. Similar results were observed in an imagery intervention study performed by Cressman and Dawson (2011) on injured athletes: the manipulation check, which was the AIIQ-2, indicated that the control group was using self-directed healing imagery during their recovery. Researchers reported the findings from the manipulation check may have contributed to the lack of differences in rehabilitation self-efficacy and healing time between the group who received the healing imagery intervention and the control group (Cressman & Dawson, 2011).

On the other hand, the face validity of the AIIQ-3 may be low as subjects may have not understood the meaning of "imagine" when completing the example. For example, the AIIQ-3 item, "I imagine each of my rehabilitation exercises," could have been interpreted as "I think about doing my rehabilitation exercises as I complete them" when the item was intended to convey something like "I use intentional rehabilitation imagery" In the future, studies using the

AIIQ-3 may want to clarify what “imagine” means when introducing the survey to participants as they may have misinterpreted this phrasing and therefore inflated reports of their imagery use. In sum, the failure of imagery use to increase on the AIIQ-3 during the treatment phase, despite self-reports of doing more imagery, may be a sign of low concurrent validity of the AIIQ-3 from the baseline to treatment phases.

Individual imagery ability describes how vividly an athlete can visually and kinesthetically image physical movements and performance (Martin et al., 1999). Because imagery ability moderates the relationship between imagery use and its intended outcome (Cumming, 2008; Goss et al., 1986), participants’ imagery ability may have contributed to the levels of task and coping self-efficacy observed throughout the 6-week study. For example, Participant C reported difficulty reproducing the imagery included in the recordings in the post-intervention survey. One limitation of the single imagery education session utilized in the present study is the lack of opportunity to assist the participant in improving their imagery practice and troubleshooting potential issues they have with the recordings. Although participants were instructed to contact the lead researcher if they had questions or issues with the imagery recordings, it is possible they did not feel comfortable doing so and therefore were not able to practice imagery effectively, which could have impaired the effectiveness of the intervention. Future research utilizing imagery education sessions may benefit from including a follow-up session to clarify any questions or issues the participant may be having with their imagery practice.

Practicing multiple types of imagery during injury rehabilitation may be directly related to athletes’ rehabilitation self-efficacy. During the treatment phase, participants C and E reported only practicing healing imagery. Because maximizing autonomy was a priority, participants were not required to practice all four audio recordings; however, it is possible that a participant could have benefitted more from using various types of imagery instead of using one for the length of the treatment phase. In previous qualitative studies, athletes described using imagery for cognitive, motivational, healing, pain management, and injury prevention purposes and noted that the type of imagery used changed depending on the stage of rehabilitation (Driediger et al., 2006). Furthermore, elite athletes at different stages of rehabilitation reported that the functions of their imagery use changed over time: athletes used healing and pain management imagery in the early phase of rehabilitation and transitioned towards cognitive imagery to rehearse sport-specific performance skills towards the end phase of rehabilitation (Evans et al., 2006). In the present study, participants C and E, who only used healing imagery, did not exhibit increases in task or coping self-efficacy, whereas participant A, who did practice all four types of athletic injury imagery, experienced an increase in task efficacy. When Cressman and Dawson (2011) tested the effects of a healing imagery intervention on the rehabilitation self-efficacy of injured athletes, they failed to find significant differences between the rehabilitation self-efficacy of the treatment and control groups, which provides further support that using healing imagery alone during rehabilitation may not be sufficient to increase rehabilitation self-efficacy because it may not be specific to the stage of rehabilitation that the athlete is in (i.e., later stages when an injury is healed and the primary goal of physical therapy sessions is strength and mobility). Furthermore, it may be that athletes in the present study did not choose the imagery type that best suited their current stage of recovery. In the future, researchers or consultants may want to consider requiring that participants perform each type of injury imagery at least once during the treatment phase or explain to participants the importance of choosing an imagery type that suits their stage of rehabilitation to maximize the effectiveness of the intervention. Alternatively, researchers could include a more general stress management or relaxation imagery audio recording as an option for participants to use during periods of high perceived stress.

Although the design of the present study included many strengths, limitations were present. First, participants received treatment at different physical therapy clinics and consequently experienced varied rehabilitation settings and quality of care. Because rehabilitation self-efficacy was the dependent variable of the present study, the lack of control regarding the quality of physical therapy treatment could have impacted the results. However, one strength of the study was that all participants experienced lower-limb injuries, which increases the commonalities between participants and the challenges they faced during rehabilitation. Second, due to the discrepancy in screening answers and the AIIQ-3, an accurate picture of baseline imagery behavior cannot be assumed in the present study, even though participants reported no previous rehabilitation imagery practice at the time of the initial screening. Third, the length of the present study may have been too short of a time period to observe the effects of the imagery education session on self-efficacy. Due to the multiple baseline design, some participants did not begin the treatment phase until there was only 1.5 to 2 weeks remaining in the study, which may have not been enough time to elicit changes in their rehabilitation self-efficacy. Because it is unclear how long it could take for imagery practice to influence rehabilitation self-efficacy, there may have been latency effects present that could explain the lack of increase in rehabilitation self-efficacy in the majority of participants. Fourth, participants in the study were at different phases of recovery and experienced different injuries. Some participants were getting ready to return to sport towards the latter weeks of the study, and others still had a long way to go in their rehabilitation. Therefore, it could be that the rehabilitation self-efficacy of participants who were in the earlier phases of rehabilitation or had more severe injuries was more difficult to influence compared to participants who were closer to returning to sport or had less severe injuries, or vis versa. In other words, the lack of control over the stage of injury rehabilitation the athletes were in as well as the type of injury incurred could have impacted the results. Lastly, although the imagery scripts were reviewed by two CMPCs, the quality of the rehabilitation imagery recordings provided to participants was not formally validated, therefore it is possible that different imagery scripts may yield different results.

Despite the limitations and results from the present study that do not suggest, outright, that a single imagery education session followed by consistent guided imagery practice increases rehabilitation self-efficacy. However, it does appear that for the majority of athletes, the imagery intervention may have helped maintain self-efficacy levels, particularly because the athletes' feedback implied that the intervention did produce psychological benefits. Participants A and E both reported that practicing imagery helped them view their rehabilitation in a more positive way and also helped them overcome negative thoughts about their recovery. Similarly, participant B stated that practicing imagery helped improve their attitude about rehabilitation, increased their hope for a full recovery, and increased their confidence in returning to sport. Participant A also reported enjoying the freedom to choose which imagery recordings to use each day, which suggests their autonomy need was fulfilled during the treatment phase. Furthermore, the fact that no participants dropped out of the study and continued the imagery practice throughout the study may indicate that they perceived it to be beneficial.

In sum, because athletes may exhibit high rehabilitation self-efficacy during baseline measurements, self-efficacy may not be the best indicator to measure the psychological effectiveness of an imagery intervention. In the future, researchers may want to measure the effects of an imagery intervention on alternative psychological variables such as general and/or re-injury anxiety, optimism, stress-related growth (Salim et al., 2016), or mood, when working with an athlete population. Additionally, future researchers should increase the length of the treatment phase of the study, include a follow-up meeting after the imagery education session, and perhaps require that participants practice each type of imagery at least once during the treatment phase.

Conclusion

The present study is the first to assess the effectiveness of an autonomy-supporting imagery intervention on the rehabilitation self-efficacy of injured athletes attending physical therapy by utilizing single subject multiple baseline design. Individuals' results were mixed with two positive effects, and eight non-effects. When assessing as all results as a whole, the multiple script option imagery intervention was perceived as helpful by athletes but either had no effect or helped maintain task and coping self-efficacy at stable levels in the present study. Because task and coping efficacy was relatively high during the baseline study and because athletes may experience a decline in task and coping efficacy during the rehabilitation process, it is possible that the imagery used in the present study prevented this typical decline from occurring and helped participants retain their high levels of rehabilitation efficacy throughout their treatment. Other factors that could have influenced the results include: the potential use of unstructured imagery during the baseline phase, differences in imagery ability, environmental factors, partial adherence to the treatment phase guidelines for imagery practice, and the relatively short length of the study. Moreover, participants' qualitative feedback about the intervention indicated that they found the recordings beneficial in helping them think more positively about their injury and overcome setbacks and negative thoughts surrounding re-injury and recovery time, so there appears to be positive effects of a multiple option imagery intervention, however, rehabilitation self-efficacy measurement may not reflect those changes. Future researchers may want to consider screening participants for baseline rehabilitation self-efficacy and then repeating the present study for those with lower self-efficacy to further examine the effects of using imagery during injury rehabilitation or assessing the intervention effects on other psychological variables such as re-injury anxiety, optimism, or resilience.

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Appendices

Appendix A

Journal of Applied Sport Psychology Submission Guidelines

All parts of the manuscript should be typewritten, double-spaced, with margins of at least one inch on all sides. Articles will be no more than 30 double-spaced pages in length for quantitative submissions and 35 for qualitative submission (including tables, figures and references). They should also include a title page, a 250-word abstract, 50-word lay summary, up to three implications for practice and complete references. Lay summaries should be included after the abstract and key words. Insert a line space after the abstract, and then include a heading (Lay Summary:) and then the lay summary text. Implications for Practice should be included after the lay summary. Insert a line space after the lay summary, and then include a heading (Implications for Practice:) and then finally the text in bullet point format. The title of the manuscript should reappear on the first page of the text. Authors should also supply a shortened version of the title suitable for the running head, not exceeding 50-character spaces. The discussion section of the manuscript should provide suitable attention to the applied implications arising from the findings of the work. Research notes with novel or interesting descriptive quantitative or qualitative data (15 pages including references, tables, figures, 100-word abstract) are welcomed submissions. Manuscripts, including tables, figures, and references, should be prepared in accordance with the Publication Manual of the American Psychology Association (Seventh Edition, 2020). Manuscripts which do not adhere to these guidelines will be returned to the authors on submission. Authors are to avoid the use of sexist, racist, and otherwise offensive language. Where relevant the cultural characteristics of any sample population studied should be described in the participant section of the method. Manuscript copies should be clear and legible and all figures must be camera ready.

From:
https://www.tandfonline.com/action/authorSubmission?show=instructions&journalCode=uasp20

Appendix B

Initial Phone Call Script with Inclusion Criteria

- Hello, my name is Peyton Bilo and I am a graduate student at Western Washington University. I understand that you are receiving physical therapy at [name of] Physical Therapy and were interested in participating in the research study I am conducting. Before going into more detail about the study, is it ok if I ask you a few questions to determine if you are eligible to participate?
- If clinic patient agrees, proceed with questions:

1. Are you at least 18 years old?
    - If "yes", proceed.
    - If "no", thank them for their time and inform them they are not eligible.
2. Do you identify as an athlete (in other words, a person who is proficient in sports and other forms of exercise)?
    - If "yes", proceed.
    - If "no", thank them for their time and inform them they are not eligible.
3. Have you incurred an injury that has prevented you from playing your sport for six or more weeks?
    - If "yes", proceed.
    - If "no", thank them for their time and inform them they are not eligible.
4. Are you currently in physical therapy for a head injury?
    - If "no", proceed.
    - If "yes", thank them for their time and inform them they are not eligible.

5. Have you participated in organized or semi-structured sporting events sometime in the last year? Examples include participation in recreational leagues, regular competitive pick-up games, organized races, etc.
    - If “yes”, proceed.
    - If “no”, thank them for their time and inform them they are not eligible.
6. Do you plan on returning to organized or semi-structured sporting events after completing rehabilitation?
    - If “yes”, proceed.
    - If “no”, thank them for their time and inform them they are not eligible.
7. Have you ever practiced guided imagery related to injury rehabilitation?
    - If “no”, proceed.
    - If “yes”, thank them for their time and inform them they are not eligible.
8. Do you know or anticipate that will you be receiving physical therapy treatment for at least four more weeks?
    - If “yes”, proceed.
    - If “no”, thank them for their time and inform them they are not eligible.
    - If “unsure”, proceed but ask participant to check with physical therapist before scheduling session.
9. Have you had this injury in the past?
    - If “no”, proceed.
    - If “yes”, thank them for their time and inform them they are not eligible.
10. Do you have a smart phone or internet access on a daily basis?
    - If “no”, proceed.

    - If “yes”, thank them for their time and inform them they are not eligible.

- If clinic patient is deemed eligible for the study: It sounds like you meet all of the criteria to be a part of the research study. Are you interested in hearing about the research and what would be asked of you as a participant?
- If clinic patient says “yes”: Great! The purpose of this research study is to better understand the effects of imagery use on athletes’ confidence during rehabilitation. The results will hopefully increase our understanding and awareness of the utility of imagery during the injury rehabilitation process. The study will last 6 weeks total. If you decide to participate, you will be asked to sign an informed consent that will explain the details regarding confidentiality and your rights as a participant. Then, there will be some demographic/background questions along with a few surveys about confidence, imagery use, and rehabilitation progress that you would complete multiple times per week moving forward, which will take approximately 15 minutes. Next, we would schedule a Zoom meeting [insert # of weeks depending on protocol for staggered baseline – possible range is 2 to 5 weeks] weeks from now that will last about 25 minutes when we will talk about imagery and its use in sport and injury rehabilitation. After that meeting, you will be asked to practice imagery for 4 days per week, which will take about 7-10 minutes each practice, and continue to complete the surveys along with a few questions about your imagery use. Upon completion of the study, you will be asked to complete a final survey and then will receive a $75 Amazon e-gift card as compensation for your time. Completion of the study is considered 80% or higher survey completion rate and completion of the final survey.
- Do you have any questions?

- After answering potential questions: Would you like to participate in the research study I have described?
- If clinic patient says "no", thank them for their time.
- If participant says "yes": Great! What is your full name? What is your email address? Do you have reliable internet or cell access now in order to complete the initial paperwork? If yes, continue. If no they cannot access it, reschedule a call until they do.
- "I am now going to send you an email with a link to the informed consent and online surveys via a secure online service. Please click on it now and read the informed consent carefully. Afterwards, you will be directed to the questionnaires. These questionnaires are very important for the data collection aspect of the study, so please complete them as accurately and honestly as you can. Go ahead and complete them now and let me know when you are done. I will also email you a copy of the informed consent for your records after this phone call. Go ahead and check that the email has been received and works."
- Once link is successfully opened: Great. Let me know when you are finished reading the informed consent and have agreed to participate. [After that]. Your code number for the first question and for all subsequent surveys is [code number]. You can complete the surveys now. Please let me know when you are finished.
- [give time to complete surveys]
- Going forward, I will send you links similar to this one, three times per week for the next 6 weeks on Mondays, Wednesdays, and Fridays. It is important that you complete the surveys as soon as possible after receiving them. In order to help you remember, I will send you a reminder text to check your email on the days that the surveys are sent. What time of day would you prefer to see these reminders?

- Great, I will plan to send them at that time. Any questions so far?
- After answering potential questions: On last item, let's schedule our Zoom meeting. What time/day between (*insert range of dates that fit timeline*) would work for you to meet for 25 minutes?
- Schedule an appropriate meeting time.
- Are you familiar with Zoom? (If not, explain).
- Sounds great, thank you so much for your time. I look forward to seeing you the (*insert date of imagery education session)* and will send you a reminder the day before our meeting with the Zoom link. If you have any questions between now and then, feel free to email, text, or call me.

Appendix C

Demographic Questions

1. What sport(s) do you play on a regular/semi-regular basis?
2. Which sports were negatively affected by your current injury (e.g., preventing from playing)?
3. What level of sport do you currently compete in?
4. How many years have you been playing competitive sport?

Please respond to questions below in reference to your current injury.

5. What type of injury do you have currently? (Please include both the area of the body and the type of injury)
6. When was the onset of this injury? If possible, provide a specific date of injury or indicate a range of dates if the injury onset was gradual.
7. In the past, have you ever received physical therapy for this same type of injury?

   Yes/No
8. In the past, have you ever received physical therapy for a different sports-related injury?

   Yes/No (skip to question 10)
9. If yes, what type of injury(s) were they (please list)?
10. What is your age in years?
11. What is your gender identity?
12. What races/ethnicities do you identify with?
13. Have you ever practiced imagery (i.e., visualization) in the past? Yes/No
14. If yes, please describe (i.e., frequency, type of imagery content, length of imagery sessions).

Appendix D

Athletic Imagery Injury Questionnaire (AIIQ-3)

Rate the frequency to which you did the following *in the last week* on a scale of:

1……2…….3…….4…….5…….6…….7…….8…….9

Never *Always*

1. Prior to performing a rehabilitation exercise, I imagine myself completing it correctly.
2. I imagine each of my rehabilitation exercises.
3. If my physiotherapist adds a new rehabilitation exercise, I imagine this new exercise.
4. I change the image of a particular rehabilitation skill or exercise if required.
5. I imagine myself having completed my rehabilitation program.
6. I imagine myself back performing injury free.
7. I imagine myself achieving my treatment goals.
8. I imagine achieving each step of my rehabilitation program.
9. I imagine my damaged tissue returning to normal.
10. I imagine my body repairing itself.
11. I imagine my bone or tissue growing as my injury mends.
12. I imagine the physiological changes my body is undergoing such as muscle or bone healing.
13. I imagine coping with the pain associated with my injury.
14. During my rehabilitation, I imagine my pain dissolving.
15. To distract myself from the pain associated with my injury, I use imagery.
16. I imagine myself working through the pain when rehabilitating my injury.

Appendix E

Athletic Injury Self-Efficacy Questionnaire (AISEQ)

Rate your confidence *in the last week* on a scale from 0% (*no confidence*) to 100% (*complete confidence*):

1. I am confident that I can perform all the required rehabilitation exercises.
2. I am confident that I can follow directions from my athletic trainer.
3. I am confident that I can perform all of my rehabilitation exercises correctly.
4. I am confident that I can do my rehabilitation exercises when I am in a bad mood.
5. I am confident that I can do my rehabilitation exercises when I feel I do not have the time.
6. I am confident that I can do my rehabilitation exercises even though I am feeling some discomfort.
7. I am confident that I can follow the rehabilitation schedule (i.e., days and times of rehabilitation) outlined by my athletic trainer.

Appendix F

Rehabilitation Progress Rating

Please indicate your satisfaction with your rehabilitation progress *in the past week:*

1……2…….3…….4…….5…….6…….7…….8…….9…….10

Very dissatisfied *Very satisfied*

Appendix G

Weekly Imagery Log

Please answer the following questions to the best of your ability with respect to the last week.

1. How many days in the last week did you use the imagery audio files?
2. Which type(s) of imagery did you use in the last week? Check all that apply.
   - o Healing imagery (if yes, how many sessions? __)
   - o Pain management imagery (if yes, how many sessions? __)
   - o Rehabilitation process imagery (if yes, how many sessions? __)
   - o Sport performance imagery (if yes, how many sessions? __)
3. Do you think that imagery had an effect on your injury rehabilitation in the last week?
   - o Yes / No / Unsure
   - o Please describe your answer.
4. Did anything happen in the last week that significantly affected your imagery use OR physical therapy sessions (e.g.., re-injury, school/work/family demands, power outages, other)?
   - o Yes / No / Unsure
   - o If yes or unsure, please describe your answer.

Appendix H

Post-Intervention Survey

1. What are your thoughts/feelings/perceptions of the imagery recordings included in this study?
2. External imagery is when you watch yourself perform the movement from an external point of view (third person) and internal imagery is when you watch yourself perform the movement from your own eyes, or an internal point of view. Please indicate the frequency to which you used each perspective:
    a. Internal:

    1………………..2………………..3…………….…..4………………..5

    Never *Rarely* *Sometimes* *Frequently* *Always*

    b. External:

    1………………..2………………..3…………….…..4………………..5

    Never *Rarely* *Sometimes* *Frequently* *Always*
3. In general, when listening to the imagery files, please rate the difficulty level you had when producing the described images:

    1………………..2………………..3…………….…..4………………..5

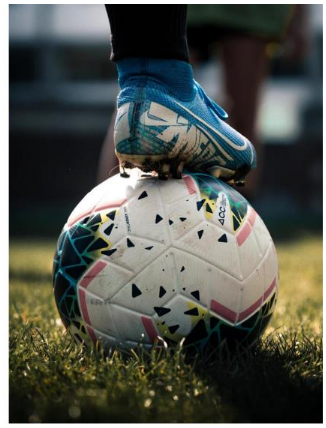
    Very Difficult *Very Easy*

    a. Please explain your previous answer:
4. Any general comments about the imagery intervention (e.g., impressions, suggestions for improvement)?

Appendix I

Physical Therapy Clinic Flyer

RECREATIONAL OR COMPETITIVE ATHLETES NEEDED!



If your injury has you sidelined, you may be eligible for a research study on the effects of imagery on athletic injury rehabilitation.

Participant Requirements:

- Be at least 18 years old
- Currently injured (excluding head injuries) and sidelined from sport for at least 6 weeks
- Have *at least* 4 weeks remaining in physical therapy
- Ability to complete online surveys for 6 weeks
- Able to attend a 25 min Zoom introduction to imagery meeting
- Willing to practice imagery 4 times per week thereafter
- Weekly time commitment varies from 15-60 minutes

Participants who complete the study will receive a $75 Amazon e-gift card

Email bilop@wwu.edu or call/text (916) 996-0583 to see if you are eligible.

Study conducted by: Peyton Bilo, masters student in Kinesiology studying Sport & Exercise Psychology at Western Washington University

Appendix J

Informed Consent

Imagery during Athletic Rehabilitation Study

Western Washington University (WWU)

Primary Researcher: Peyton Bilo, master's student in Sport & Exercise Psychology at WWU

Research Supervisor: Dr. Linda Keeler, Professor of Sport & Exercise Psychology at WWU

We are asking you to be in a research study. Participation is voluntary. The purpose of this form is to give you the information you will need to help you decide whether to participate. Please read the form carefully. You may ask questions about anything that is not clear. When we have answered all of your questions, you can decide if you want to be in the study or not. This process is called "informed consent."

Purpose and Benefit: The purpose of this research study is to better understand the effects of imagery use on athletes' self-efficacy, which refers to task-specific self-confidence, during rehabilitation. The primary benefit of the study is to increase sport psychology professionals understanding and awareness of the utility of imagery use during the athletic injury rehabilitation process and inform programs geared to improve rehabilitation outcomes and enhance responses to injury through implementation of mental skills.

Summary of your Participation: If you choose to participate in this study, you will be asked to:

- Take surveys using an online survey platform three times per week, which should take approximately 16 minutes total to complete each week for a total of 6 weeks (e.g., questions about self-confidence during injury rehabilitation, imagery use, rehabilitation progress)
- Participation in a one-on-one meeting sometime during the 6 weeks with the lead researcher using Zoom conferencing lasting approximately 25 minutes.
- After the meeting, you will be asked to dedicate about 10 minutes, 4 days per week for the remainder of the six-week study to practice imagery and dedicate about 8 minutes per day to answer questions about the imagery practice and your progress in rehabilitation via the online survey platform.
- At the end of the study, you will be asked to complete a final survey regarding your experience in this research study, which will take 10 minutes.

Risks: Although there are no expected risks to participating, you may feel uncomfortable with some of the imagery recording directions or by answering questions regarding your injury. You are welcome to contact the lead researcher with any issues or questions pertaining to the study at any time. If you are injured as a result of participation, you will be referred for medical treatment, which will be billed like any normal doctor's visit.

Data and Privacy Protections: Your participation and information will not affect your status in physical therapy. All information about you will be stored securely and will be kept confidential, meaning that only the lead researcher and research supervisor will have access to your identifiable responses. You will be given a participant number, which will be used to label your data; the link between this participant number and your name and other identifying information will be stored separately from your survey responses. We have asked for your email address and phone number in order for you to receive reminders to complete the surveys on time; however, your contact information will not be stored in the same location as your data. Your contact information will be destroyed once data collection is complete. We take every precaution to protect your information, although no guarantee of security can be absolute. We believe the chances of you being identified are low due to the protections in place for your privacy. Your data, with identifiers removed, may be used, or distributed for future research without your additional informed consent.

Withdrawal: Your participation is voluntary. You can leave the study at any time with no penalty. Your withdrawal from the research study will have no effect on your physical therapy sessions. You can request to have your data and contact information destroyed up until the end of data collection for all participants, at which point we will no longer know which responses are yours.

Incentive: If you complete the study (defined as 80% or higher survey completion rate and completion of the final survey) you will receive a $75 Amazon gift card in addition to furthering the field of knowledge about the utility of mental skills during athletic injury rehabilitation.

This research is being conducted by Peyton Bilo, a graduate student at Western Washington University, under the supervision of Dr. Linda Keeler. Any questions that you may have about this study or your participation may be directed to Peyton at bilop@wwu.edu, or Dr. Keeler at keelerl2@wwu.edu.

The Institutional Review Board (IRB) at Western Washington University has approved this study. If you have any questions about 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 Peyton Bilo.
****
Participants' Electronic Consent: By signing below, you are indicating that you are over 18 years old, you have read this form, you have had your questions answered, you understand the tasks involved, and you wish to volunteer to take part in this research study. You will be emailed a copy of this informed consent for your records.

Click here to consent: ____ yes _no

Appendix K

Sample Timeline for a Participant

Week 1

- Initial phone call
  - Informed consent, demographic questionnaire, schedule education session
- AISEQ (x3)
- AIIQ-3 (x1)
- Rehabilitation Progress Rating

Week 2

- AISEQ (x3)
- Rehabilitation Progress Rating

Week 3

- AISEQ (x3)
- AIIQ-3 (x1)
- Rehabilitation Progress Rating

Week 4

- Imagery education session (beginning of the week)
- AISEQ (x3)
- AIIQ-3 (x1)
- Imagery logbook (x1)
- Rehabiilitation Progress Rating

Week 5

- AISEQ (x3)
- Imagery logbook (x1)
- Rehabilitation Progress Rating

Week 6

- AISEQ (x3)
- AIIQ-3 (x1)
- Imagery logbook (x1)
- Rehabilitation Progress Rating
- Post-intervention Survey

Appendix L

Rehabilitation Self-Efficacy Data Collection Procedure

Participant A: Imagery education session scheduled between data collection points 5 and 6

1 2 3 4 5 | 6 7 8 9 10 11 12 13 14 15 16 17 18

Baseline Data Collection (AISEQ) **Intervention Data Collection (AISEQ)**

Participant B: Imagery education session scheduled between data collection points 7 and 8

1 2 3 4 5 6 7 | 8 9 10 11 12 13 14 15 16 17 18

Baseline Data Collection (AISEQ) **Intervention Data Collection (AISEQ)**

Participant C: Imagery education session scheduled between data collection points 9 and 10

1 2 3 4 5 6 7 8 9 | 10 11 12 13 14 15 16 17 18

Baseline Data Collection (AISEQ) **Intervention Data Collection (AISEQ)**

Participant D: Imagery education session scheduled between data collection points 11 and 12

1 2 3 4 5 6 7 8 9 10 11 | 12 13 14 15 16 17 18

Baseline Data Collection (AISEQ) **Intervention Data Collection (AISEQ)**

Participant E: Imagery education session scheduled between data collection points 13 and 14

1 2 3 4 5 6 7 8 9 10 11 12 13 | 14 15 16 17 18

Baseline Data Collection (AISEQ) **Intervention Data Collection (AISEQ)**

Appendix M

Imagery Education Session Script

- Hi **participants' name*,* how are you doing today?
- Thank you again for agreeing to participate in my research study. Just to let you know, I will be following a script closely for the majority of our session today to ensure that I cover everything. If you have questions, I will be able to answer them towards the end of the session. Does that sound okay?
- Today I will be teaching you about using imagery during injury rehabilitation. I will begin my defining and explaining what imagery is and how it is used. Then, I will summarize the current research regarding the demonstrated benefits of using imagery in sport and during rehabilitation. After that, we will talk about the different types of imagery used in rehabilitation, and then towards the end of the session I will provide you with a few audio files with imagery recordings and explain how to use them. Any questions so far?
- Great, let's get started. Imagery is defined as the mental creation of an object, scene, or sensation as though it were occurring in reality (Driediger et al., 2006). It can involve imagining a past experience or it may take place in the future (Driediger et al., 2006). Some people call it visualization, but in order to be effective imagery should incorporate multiple senses such as sound, smell, feeling/weight movement, not just visual sight. Imagery can also take place from a first or a third person perspective (Cumming et al., 2004). That means imagery can be done from the perspective of your own eyes or like you are watching yourself on video or TV.

- Imagery can cause a physical response from the body. Before we go any further, let's do a quick practice so you can get a better sense of what I'm talking about.
    - Take a moment and imagine you are holding a big, juicy lemon. Imagine the bumpy skin of the lemon as you hold it in your hand and move it around. Now, place the lemon on a cutting board and cut it open with a knife, hearing a chopping sound. As you cut the lemon, notice a few drops of the juice squeeze out of the lemon and onto the cutting board. You smell the sour juice of the lemon as it seeps out onto the cutting board. Now, pick up the lemon and bite into the sour, juicy pulp.
    - Could you smell it, feel it, taste it? As you bit into the lemon, did you start salivating?
    - As you can tell from this example, imagery can cause noticeable changes in our bodies without having to physically move around at all, just by practicing imagery.
- Now, let's talk about some of the research regarding imagery use in sport.
    - Research has demonstrated that imagery is one of the most widely used performance enhancing techniques in sport.
    - Elite athletes tend to use imagery more than beginner athletes (Cumming et al., 2004) and do so more systematically or regularly.
    - Current research supports that using imagery in sport can: improve athletic skill development, increase confidence and motivation, help reduce worries and anxiety, and help athletes prepare for competitions (Ievleva & Orlick, 1991; Cumming & Williams, 2012; Paivio, 1985).

- Researchers have also studied the benefits of using imagery during injury rehabilitation.
    - Practicing imagery during periods of injury can:
        - Decrease perceptions of physical pain (Cupal & Brewer, 2001)
        - Increase muscular strength, endurance, and range of motion (Cupal & Brewer, 2001; Hoyek et al., 2014)
        - Manage emotions, anxiety, worry, and stress related to injuries and rehabilitation (Cupal & Brewer, 2001)
        - Prepare athletes to return to competition both physically, by helping maintain sport specific skills and mentally, by increasing confidence and decreasing re-injury anxiety (Maddison et al., 2012; Wesch et al., 2016)
- Do you have any questions so far?
- Now let's move on to the different types of imagery that can be used during injury rehabilitation. There are four basic types of imagery that are used by athletes when they are injured (Taylor & Taylor, 1997). These include healing, pain reducing, PT exercise imagery, and sport-related imagery (Taylor & Taylor, 1997). I will now provide a bit more detail on each type.
    - Healing imagery involves imagining an injured body part healing or imagining a full restoration of strength to the injured area. For example, this could involve imagining a broken bone repair itself or picturing and feeling an injured body part functioning well again (Heil, 1993).
    - Pain management imagery is performed by imagining a reduction or change in one's pain levels. This can be done by imagining a peaceful scene with an absence of pain, imagining the pain as a physical symbol and imagining it leave

the body, or viewing pain as a challenge to overcome and using it as motivation to recover (Driediger et al., 2006).

  - Rehabilitation process imagery includes images regarding the process of physical recovery and the things that might be experienced during rehabilitation; including overcoming any setbacks, attending physical therapy sessions, doing home exercise routines, and maintaining a positive and focused attitude along the way (Heil, 1993; Ievleva & Orlick, 1991).
  - Sport performance imagery involves rehearsing sport specific skills in one's mind. This could involve imagining oneself fully recovered and participating in competition or practice or improving areas of one's performance that were previously neglected (Richardson & Latuda, 1995).

- Do you have any questions about these four types of imagery?
- Now, I am going to explain in more detail what I will be asking of you for the next **insert weeks of intervention phase**.
  - I have created and recorded four guided imagery recordings (one for each of the four types of imagery I just explained) for you to use regularly to help with your injury recovery process. I will send these as audio files to your email after today's session is over.
  - For the remainder of the study, please listen to at least one (or more if you wish) of the recordings for 4 days per week.
  - You may choose to listen to any of the four recordings that best suit your needs. Please try to practice imagery seated or lying in a quiet place that is comfortable for you. The recordings will prompt you with more detail on how to perform your

practice. In the beginning, you may want to try out different recordings in order to see which one you like the best. It is recommended that you try out each recording at some point during the study because different people have different imagery preferences. In case you forget what each type of imagery is, there is a brief explanation provided at the beginning of each recording.

- The more you practice imagery, the more benefits it will have on your healing and return to sport (O et al., 2014). Remember that using imagery has been shown to improve rates of healing, decrease pain, and can lead to better physical and mental responses to rehabilitation (Cupal & Brewer, 2001; Hoyek et al., 2014; Maddison et al., 2012; Wesch et al., 2016)
- The recordings range from 5-7 minutes] in length. To help you remember to practice imagery, let's discuss some ways that you can create reminders in your home. Do you have something that you see every day, such as a mirror or nightstand, that you could tape a note to so that it would help you remember to do imagery? Another option could be to set a reminder on your phone. What will work for you?
- [Discuss what works best for participant]
- Additionally, once a week there will be a brief imagery logbook for you to complete online. It should take about 5 minutes to complete and is just so we can get a sense of your experiences each week with imagery and physical therapy. There will be questions related to how many days per week you practiced imagery, which recordings you used, and the opportunity to report anything that

affected your rehabilitation or imagery use. Like the other surveys I have given you, please fill this logbook out as honestly as possible each week.

  - Just to remind you, at the end of the study, you will be asked to complete a final survey regarding your experience in this research study. If you fully participate in the study (meaning that you complete at least 80% of the surveys and complete the final questionnaire), I will email you the $75 Amazon gift card.

- Do you have any questions?

Thank you for taking the time to meet with me today. I will send you the imagery audio files in a few minutes and you may begin practicing imagery as soon as you like. Please listen to any of the four recordings any four days in the next week and continue doing so until the end of the study. As I said before, if you have any questions or concerns please call, text, or email me at any time.

Appendix N

Guided Imagery Scripts

Healing Imagery

Today we are going to practice healing imagery, which involves creating images in your mind that represent your particular injury successfully healing and your body repairing itself.

Before beginning this activity, find a quiet place with dim lighting. Remove or loosen any restrictive clothing and find a comfortable position, either lying horizonal on your back or seated in a comfortable chair with your neck supported. Remove any jewelry, contacts, or smart watches that may distract you during this practice. You may close your eyes as you listen if this is comfortable for you, or just soften your gaze and look down at your lap. Pause the recording now and press play once you find a comfortable position.

Let’s get started. Begin by taking a few deep breaths. Inhale through the nose (breathe in), out through the mouth (breathe out). In through the nose (breathe in), out through the mouth (breathe out).

Now, imagine an area of your body that you want to send some healing to. Perhaps focus on an area that feels injured, stiff, tender, or sore. Shift all of your attention towards that area, it is the only thing on your mind.

Begin by giving thanks for the healing that has already occurred in this area up until now. Before this moment, the body has already been working to mend and repair itself. Sink into this area. Begin to gain an awareness of exactly what it feels like. Get to know the area. Feel the area. See the area.

Next, imagine the area softening and relaxing. Imagine all of those tissues becoming more open, clear, and vibrant. See and feel the fibers or bones in the damaged area growing and healing back together. As they grow back together, the fibers are becoming powerful and regaining their full strength. Imagine the fibers are now strong, tough, and indestructible. They are mending and forming into healthy and functioning tissues or bones.

Now, let's bring in the power of light. Imagine a warm ray of sunshine bringing healing energy to the injured area. As the light shines on the area, feel the connection between you and its power as the sun brings the injured area energy, strength, and full healing. The sunshine brings with it love, peace, compassion, forgiveness, sweetness, grace, harmony. Whatever resonates most strongly with you and most strongly with your current situation. Feel all of the warmth and love from the sun pouring into the area. These feelings and emotions are received with open arms by the area and are fully welcomed.

Next, bring your attention to your heartbeat. Imagine the blood flowing from your heart back to the area that needs healing. The flowing blood brings with it all of the healing factors and nutrients it needs to heal. As the blood flows away from the area, imagine it carrying with it all of the waste and damaged cells that were once at the injured area as they dissipate away from the healing site. As your heart pumps, it also sends love and compassion to your injury, reminding you that this state is temporary and that your body knows what to do to heal.

Now, focus your attention once again on the area that requires healing, and imagine it fully healed and stable. Imagine that it is the strongest it has ever been. You are completely safe and healed.

Imagine yourself strong, flexible, and agile. Feel yourself standing up and moving with ease and comfort as you feel the transfer of weight shift seamlessly as you walk. Feel your body being fully healed, strong, and healthy. You are ready to compete and perform at your best in your sport once again. Your body is strong, healthy, and efficient, and you are completely healed.

Now, begin to notice how your body feels now compared to starting imagery today. What feels different? What feels the same?

Your body thanks you for practicing healing imagery today. Thank you for taking the time to do this self-healing practice.

If you want to remain in the moment, you may pause the recording now and restart once your practice is ending.

Now that your practice has ended, slowly bring your attention back to the room as I count backwards from 5…4…begin to wiggle your fingers and toes…3…begin to move your hands and feet…2…move your head and neck in a way that is comfortable to you…1…slowly begin to open your eyes and take a few deep breaths before sitting up and ending your healing imagery session.

Pain Management Imagery

Today we are going to practice pain reducing imagery, which involves creating images in your mind that represent your body freeing itself of pain while in a comfortable and relaxed state. Before beginning this activity, find a quiet place with dim lighting. Remove or loosen any restrictive clothing and find a comfortable position, either lying horizonal on your back or seated in a comfortable chair. Remove any jewelry, contacts, or smart watches that may distract you during this practice. You may close your eyes if this is comfortable for you or just soften your gaze and look down at your lap. Pause the recording now and press play once you find a comfortable position.

Begin by taking a few deep breaths. Inhale through the nose (breathe in), out through the mouth (breathe out). In through the nose (breathe in), out through the mouth (breathe out).

Begin to focus on the pain you are currently feeling. Where is it in your body? What is it like? Is it stiff, tense, sharp, hot, dull? Spend a moment just being with the pain and letting go of any fear, avoidance, anxiety, or negative feelings that are associated with the pain. Take a moment to thank the sensation of pain for communicating an important message to you of permission to take care of your body.

Once you have a clear sense of the location and sensation of your pain, begin to imagine the pain as an object. Perhaps assign the pain a shape, a color, a size. Now, imagine that the pain, which is now the object, is a separate entity from your body.

Next, watch and feel the object as it leaves the injured area of your body. Imagine the object exits your injury and your body, slowly moving farther and farther away from your sight off into the horizon, eventually fading away into the distance. You feel relief and at peace as you watch the object slowly fades away into nothing. Your body calms, maybe your shoulders sink down away from your ears, maybe your heart rate becomes slower. Your body is now at ease.

Now, imagine it is the next morning. As you rise from bed in the morning, you feel light and refreshed. Notice the feeling of the ground as you imagine your feet gently landing on the floor. What does the ground feel like? Begin to picture moving through your daily routine in a healthy feeling body. You feel in tune with your body and are able to listen to what it is telling you. As you perform your daily tasks, you move through the day with ease. As you move through your day with ease, notice any pleasant smells, tastes, and sounds. Feel your body move through the day in perfect harmony with the earth, feeling stable, strong, and at peace.

Pause

Your body thanks you for practicing self-care imagery today.

Thank you for taking the time to do this self-healing practice.

If you want to remain in the moment, you may pause the recording now and restart once your practice is ending.

Slowly bring your attention back to the room as I count backwards from 5…4…begin to wiggle your fingers and toes…3…begin to move your hands and feet…2…move your head and neck in a way that is comfortable to you…1…slowly begin to open your eyes and take a few deep breaths before sitting up and ending your pain reduction imagery session.

Rehabilitation Process Imagery

Today we are going to practice physical therapy exercise imagery, which involves creating images in your mind about things you may experience during physical therapy.

Before beginning this activity, find a quiet place with dim lighting. Remove or loosen any restrictive clothing and find a comfortable position, either lying horizonal on your back or seated in a comfortable chair. Remove any jewelry, contacts, or smart watches that may distract you during this practice. You may close your eyes if this is comfortable for you or just soften your gaze and look down at your lap. Pause the recording now and press play once you find a comfortable position.

Begin by taking a few deep breaths. Inhale through the nose (breathe in), out through the mouth (breathe out). In through the nose (breathe in), out through the mouth (breathe out).

Imagine that you are on your way to a physical therapy session. You are on time and feel excited, energetic, and optimistic about today's session. Entering the clinic, you are greeted with a smile and informed that your therapist that you have arrived for the session. Notice the smell of the clinic and the temperature in the room. You wait only a brief moment before your therapist calls you back to begin the appointment.

The session begins and you inform your physical therapist of the recent progress you have made with your injury. You are honest with your PT and explain how your body feels today. You wholeheartedly trust the physical therapy care given to you.

Now imagine that you are performing some therapy exercises with your physical therapist. Imagine an exercise that is easy for you to perform. Picture yourself moving through the exercise with confidence and ease. Notice the feeling of the surface you are performing the exercises on and how it feels when it comes in contact with your skin. Feel your muscles activating and strengthening as you perform the exercise. You feel capable and strong while completing this exercise. As you do this, notice the sounds and smells of the room.

Pause

Now, you move onto a more difficult exercise. In this session, imagine yourself performing the exercise with precise control. Notice the feeling of the surface you are performing the exercises on and how it feels when it comes in contact with your skin and notice the sounds and smells of the room. You are able to complete the exercise feeling strong and in total control of your body. You are stable. You are making progress. As a result of this success, you feel an increased sense of motivation to complete your home exercise program.

Now, take a few moments and imagine completing other therapy exercises with the same, confidence, stability, and success.

Big pause

As your session comes to an end, you realize how far you have already come in the recovery process and trust that your body will continue to progress in a positive direction as time goes on. Today's session instills a sense of confidence in you and you realize that if you continue to follow the plan set by your physical therapist, you can heal and return to your sport stronger.

Before you leave, the physical therapist provides you with an updated list of exercises to perform at home before your next sessions. You are confident that you will have time to adhere to the program that you were given. You picture the time and place that you will successfully complete the exercises you were provided. As you leave the session, you are able to schedule another appointment that lines up well with your schedule and that you know you will be able to attend. You leave the clinic feeling motivated, re-energized, and as though you are one step closer in returning to your sport. You feel confident in the comeback program that you have established with your PT and feel that it is important to trust the process of your rehabilitation. Your body thanks you for practicing rehabilitation process imagery today. Thank you for taking the time to do this self-healing practice.

If you want to remain in the moment, you may pause the recording now and restart once your practice is ending.

Slowly bring your attention back to the room as I count backwards from 5…4…begin to wiggle your fingers and toes…3…begin to move your hands and feet…2…move your head and neck in a way that is comfortable to you…1…slowly begin to open your eyes and take a few deep breaths before sitting up and ending your physical therapy exercise imagery session.

Performance Imagery

Today we are going to practice sport-related imagery, which involves creating images in your mind of successfully performing your sport in practice and competition.

Before beginning this activity, find a quiet place with dim lighting. Remove or loosen any restrictive clothing and find a comfortable position, either lying horizonal on your back or seated in a comfortable chair. Remove any jewelry, contacts, or smart watches that may distract you during this practice. You may close your eyes if this is comfortable for you or just soften your gaze and look down at your lap. Pause the recording now and press play once you find a comfortable position.

Begin by taking a few deep breaths. Inhale through the nose (breathe in), out through the mouth (breathe out). In through the nose (breathe in), out through the mouth (breathe out).

Begin by bringing your mind to a place where you frequently practice, play, or engage in your sport. In this moment, imagine you feel ready to participate in a training session. Imagine the smells around you, the temperature of the air, and the feeling of the clothing on your skin. Notice the other people around: this could be members of the community, your teammates, your family, or your coach. Take a moment to imagine the typical interactions you have with those you are usually surrounded by. If you typically do not experience interactions with others, bring your attention to the environment that is around you.

You are aware of your training plan for the day and begin your warmup. As you begin to move, imagine your body feeling full of strength and your mind concentrating on the task at hand with ease. There are aspects of this practice that come easily to you and suit your strengths. You feel fit, stable, balanced, and prepared. You enjoy working hard and fine tuning the movements that improve your craft. Notice how your body feels in this moment. Other times during your training are more challenging. During these moments, you are able to persist and endure, putting full effort into your technique. You feel a strong sense of accomplishment as you notice your technique steadily improving. Noticing this fills your body with excitement, motivation, and a renewed sense of energy. You are able to maintain focus on each element of the skill, moving gracefully through the training session. Notice the strength, stability, endurance, and power of your body as you move through the session. You might notice beads of sweat on your skin, representing hard work. As the session comes to an end, you are filled with gratitude for your body and its abilities and feel thankful to be able to practice your sport today. It feels amazing to be back in your training environment again feeling stronger and filled with a renewed sense of energy and motivation.

Next, fast forward into the future and bring your mind to a place where your competitions frequently occur. Your competition is about to begin, and you are feeling excited and confident. Your warm-up went smoothly, your body feels fresh, and your movements feel quick and sharp. Notice the sounds around you and how the temperature of the air feels on your skin. Notice how the uniform or jersey fits on your body and how the surface beneath you feels as you move over or through it. You are 100% ready physically and mentally.

Now that you are fully healed from your injury and back in competition, you begin to realize that you have returned as a stronger, smarter, and more well-rounded athlete. You are fully confident in your ability and your body is strong and stable. Take a moment to imagine a few minutes of the competition. In those moments, your body feels full of strength and the competition unfolds with effortless flow.

When your competitors make a play or a move, you are able to respond quickly and successfully with a clear head. See yourself moving with power, agility, skill, and dominance. You remain calm and focused under pressure, maximizing every moment.

Now, focus on something incredible that you want to happen in your performance. You are 100% dialed in mentally and physically. Imagine the feelings of achievement that come along with reaching your goal and succeeding. Celebrate this moment. Your body fills with gratitude in this moment. Feel the energy flowing through your body.

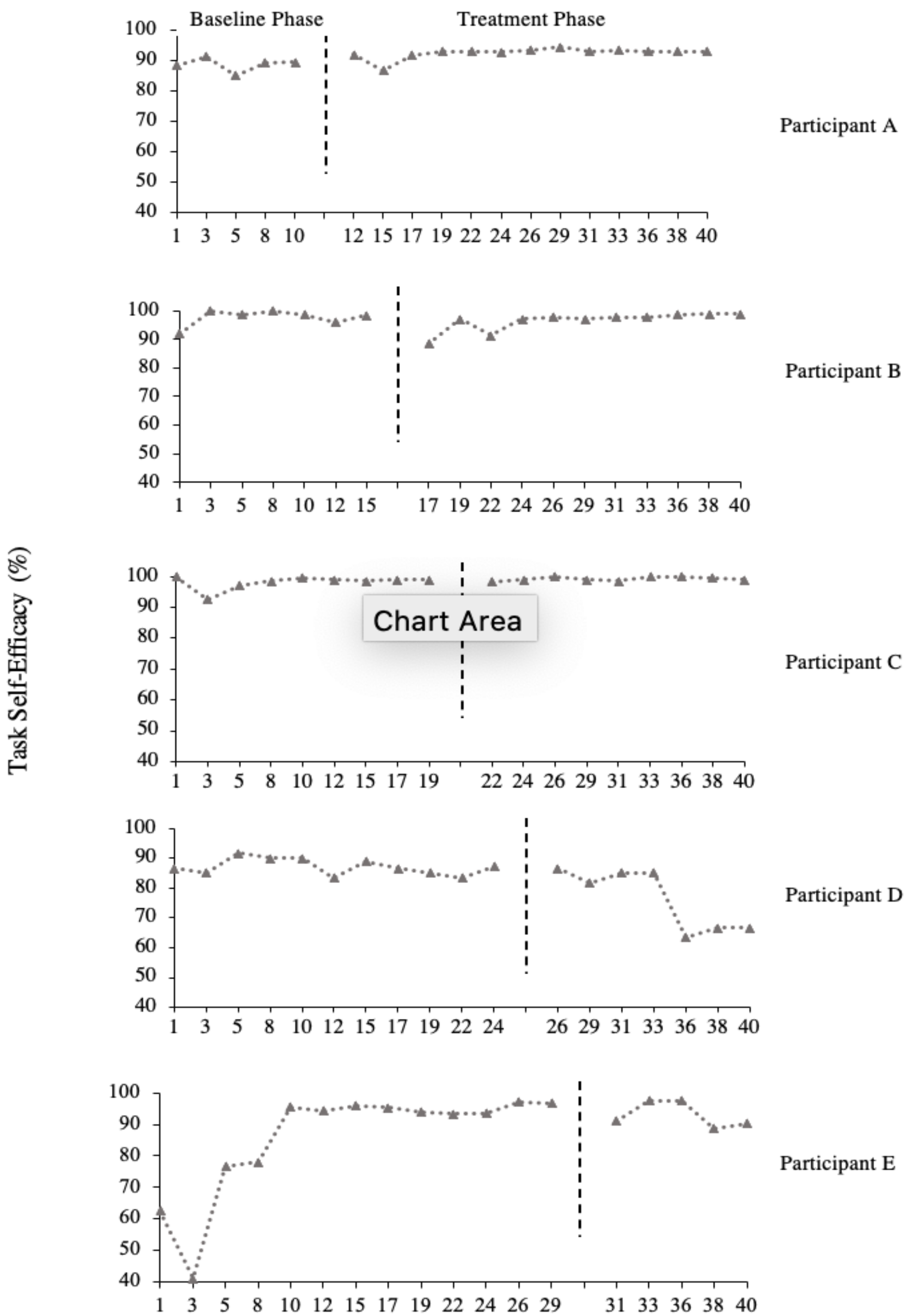
Your body thanks you for practicing performance imagery today. Thank you for taking the time to do this self-healing practice.

If you want to remain in the moment, you may pause the recording now and restart once your practice is ending.

Slowly bring your attention back to the room as I count backwards from 5…4…begin to wiggle your fingers and toes…3…begin to move your hands and feet…2…move your head and neck in a way that is comfortable to you…1…slowly begin to open your eyes and take a few deep breaths before sitting up and ending your sport-related imagery session.

Appendix O

Task Self-Efficacy Results



Appendix P

Coping Self-Efficacy Results