

[Physical Therapy]

Fear of Reinjury in Athletes: Implications for Rehabilitation

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Context: A sports injury has both physical and psychological consequences for the athlete. A common postinjury psychological response is elevated fear of reinjury.

Objective: To provide an overview of the implications of fear of reinjury on the rehabilitation of athletes, including clinical methods to measure fear of reinjury; the impact of fear of reinjury on rehabilitation outcomes, including physical impairments, function, and return to sports rate; and potential interventions to address fear of reinjury during rehabilitation.

Evidence Acquisition: PubMed was searched for articles published in the past 16 years (1990-2016) relating to fear of reinjury in athletes. The reference lists of the retrieved articles were searched for additionally relevant articles.

Study Design: Clinical review.

Level of Evidence: Level 3.

Results: Fear of reinjury after a sports injury can negatively affect the recovery of physical impairments, reduce self-report function, and prevent a successful return to sport. Athletes with high fear of reinjury might benefit from a psychologically informed practice approach to improve rehabilitation outcomes. The application of psychologically informed practice would be to measure fear of reinjury in the injured athletes and provide interventions to reduce fear of reinjury to optimize rehabilitation outcomes.

Conclusion: Fear of reinjury after a sports injury can lead to poor rehabilitation outcomes. Incorporating principles of psychologically informed practice into sports injury rehabilitation could improve rehabilitation outcomes for athletes with high fear of reinjury.

Keywords: kinesiophobia; sports rehabilitation; rehabilitation outcomes; psychologically informed practice

Each year an estimated 3 to 7 million sports-related injuries occur in the United States.^{9,14} A sports injury causes pain and physical impairments²⁶ and also has a psychological impact.^{16,76} A common psychological response to sports injury is fear of reinjury.^{8,29,38,41,65,79} Other potential psychological responses of an injured athlete include anxiety, depression, frustration, tension, and decreased self-esteem.^{15,16,31,60,68,79,82-84,88,93} These psychological responses are generally greatest immediately after sports injury and lessen during the rehabilitation process.^{11,12,28,32,42} However, they often rebound prior to return to sports, consistent with a “U pattern of recovery.”^{13,17,56,64,67} If unaddressed and unresolved, these

elevated psychological responses to the injury can slow rehabilitation progress and delay return to sports.^{91,92}

Fear of reinjury in athletes is similar to fear of movement/reinjury, also called *kinesiophobia*,⁴⁰ which is a primary psychosocial construct in the fear-avoidance model.⁸⁵ The fear-avoidance model was developed to describe the transition from acute to chronic pain in patients with low back pain.⁴⁴ The similarity with athletes is that athletes who report fear of reinjury also are likely to exhibit elevated kinesiophobia.^{6,24,41,45,46} However, the underlying reason for elevated kinesiophobia in athletes may not be pain related because pain levels are often low at the time of return to

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Table 1. Overview of all selected self-report questionnaires

Questionnaire	Population	Key Construct	Score
Emotional Responses of Athletes to Injury Questionnaire (ERAIQ) ⁷⁷	Athletes	Emotions after injury Perceptions of recovery	Open-ended questions
Return to Sport After Serious Injury Questionnaire (RSSIQ) ⁶⁶	Athletes	Perceived psychological outcomes of returning to sports	7-point Likert-type scale
ACL-Quality of Life (ACL-QoL) ⁵⁴	ACL injury	Symptoms and physical complaints Work-related concerns Recreational activities and sports participation Lifestyle Social and emotional feelings	100-mm visual analog scale
ACL-Return to Sport after Injury (ACL-RSI) ⁸⁹	ACL injury	Emotions Confidence in performance Risk appraisal	0- to 100-point scale with 10-point increments
Tampa Scale for Kinesiophobia (TSK) ⁸⁴	Chronic pain	Fear of movement/reinjury	4-point Likert-type scale

ACL, anterior cruciate ligament.

sport.²⁷ Reinjury anxiety is a related psychological construct that is not emphasized in fear-avoidance models for chronic pain development. Reinjury anxiety will not be the focus of this paper but may be relevant to athletic populations.⁸⁶ The distinction between reinjury anxiety and fear of reinjury is that anxiety is more of a negative thought or worry of the consequences of injury (eg, additional surgery and more time in rehabilitation) while fear of reinjury is specific to fear of the injury itself.³⁰ As there is no certainty about the extent of reinjury risk and situations, athletes possibly have more reinjury anxiety as opposed to fear of reinjury or these can occur together.^{86,87} Less is known about the impact of reinjury anxiety, while fear of reinjury can adversely result in both physiological (such as muscular guarding) and psychological changes (such as distraction and lack of trust in the injured site) that can affect rehabilitation outcomes.³⁴

The objective of this clinical review is to discuss the implications of fear of reinjury in sports injury rehabilitation. First, we will review different methods to measure fear of reinjury. Second, we will present findings related to the impact of fear of reinjury on the recovery of physical impairments, function, and the return-to-sport rate. Finally, we will explore methods to address fear of reinjury during rehabilitation.

METHODS

Publications related to fear of reinjury in athletes were identified via a search of the PubMed database over the past 16 years (1990-2016). The reference lists of retrieved articles were also searched for additionally relevant articles.

METHODS TO MEASURE FEAR OF REINJURY

Subjective interview or self-report questionnaires are frequently used to measure fear of reinjury. Subjective interview requires asking athletes whether they have fear of reinjury and to describe their fears about reinjury and/or returning to sports.^{2,24,64} Self-report questionnaires are more often administered in clinical and research settings and allow for quantification of the amount of fear of reinjury. Another method proposed to measure fear of reinjury is neurocognitive assessment using techniques such as electroencephalography and functional magnetic resonance imaging.⁷³ While neurocognitive assessment provides an objective approach to evaluate psychological states,⁷³ it does not allow for rapid measurement of fear of reinjury in clinical settings.

Several questionnaires are available to measure fear of reinjury in injured athletes (Table 1). These questionnaires differ in their purpose and target population. The Emotional Responses of Athletes to Injury Questionnaire (ERAIQ) evaluates emotional responses to injury and measures athletes' fears about returning to sports.⁷⁷ The ERAIQ can also be utilized during initial assessment to help design psychological-based interventions and assist athletes in coping with injury.^{56,76} The Return to Sport After Serious Injury Questionnaire (RSSIQ) evaluates cognitive, affective, and behavioral aspects of the athlete's return-to-sport outcomes and measures whether fear of reinjury has interfered with performance since returning to sports.⁶⁶ The ERAIQ and RSSIQ can be used for any athlete. On the other hand, the Anterior Cruciate Ligament-Quality of Life (ACL-QoL) and

ACL–Return to Sport after Injury (ACL-RSI) were specifically developed for athletes with anterior cruciate ligament (ACL) injury. The ACL-QoL evaluates quality of life in relation to the ACL injury and measures fear of knee giving way, fear of playing contact sports, and fear of reinjury.⁵⁵ The ACL-RSI evaluates psychological readiness to return to sports participation after ACL reconstruction and has items related to fear of reinjury/accidental injury during sport activities.⁸⁹ The Tampa Scale for Kinesiophobia (TSK) and its shortened version (TSK-11) were developed for chronic pain populations to evaluate fear associated with movement, physical activity, and reinjury.⁸⁴ However, the TSK and TSK-11 have been used to measure fear of reinjury in athletes with ACL reconstruction,^{12,27,32,41,46} midshaft tibia and fibula fracture,²³ Achilles tendon rupture,⁶² and elbow injuries.⁶⁹

Other considerations when using questionnaires to measure fear of reinjury include the information generated and the timing of administration. The ERAIQ measures fear of reinjury with an open-ended question, providing greater depth of understanding of an athlete's fear, while the other 4 questionnaires measure fear of reinjury with a scale, which allows quantitative comparisons between athletes and within athletes over time. The RSSIQ is appropriate after athletes have returned to sports, while the other 4 questionnaires can be used at any time point.

IMPACT OF FEAR OF REINJURY ON REHABILITATION OUTCOMES

Physical Impairments

Few studies have examined the influence of fear of reinjury on the recovery of physical impairments. Fear of reinjury may impact muscle endurance and activation after Achilles tendinopathy⁷⁵ and traumatic meniscal tears,⁵⁹ respectively. Fear of reinjury may also cause altered muscle recruitment strategies, which increases the likelihood of actual reinjury.^{58,78,94} In addition, fear of reinjury is linked to decreased dynamic knee stability and limited knee range of motion after ACL reconstruction³² and total knee arthroplasty.¹⁰ Thus, high fear of reinjury may influence neuromuscular deficits.

Function

Fear of reinjury is associated with a number of sports injuries. For athletes with ACL reconstruction, fear of reinjury appears to influence function in a phase-specific manner that depends on the rehabilitation timeframe. In the early phase of rehabilitation, there appears to be an inconsistent association between fear of reinjury and self-report function.^{11,12,39} In the late phase of rehabilitation, fear of reinjury is associated with reduced self-report function.^{32,41,45} On the other hand, fear of reinjury seems to be consistently related to function for athletes with other injured body regions. For example, fear of reinjury is related to reduced self-report function and low level of physical activity after elbow injuries⁶⁹ and Achilles tendon rupture.⁶² Overall it appears fear of reinjury may mostly influence function when

close to return to sports as it can increase at this timeframe. Athletes with high fear of reinjury may reduce exposure to physical activities in which they can potentially reinjure themselves, which leads to an athlete's perception of low function. Athletes with reduced self-reported function should also be assessed for high fear of reinjury.

Return to Sports

Fear of reinjury can diminish sports participations and delay return to sports.^{1-6,8,19,20,22-24,33,35,38,39,42,43,47,49,51,53,61,72,80} In addition, fear of reinjury can result in attentional distractions and affect an athlete's postinjury performance.^{60,63,66,67} Fear of reinjury is associated with return-to-sports outcomes after ACL reconstruction when evaluated at presurgery,¹ 4 and 6 months postsurgery,^{5,57} 1 year postsurgery,⁸¹ and 3 to 4 years postsurgery.⁴¹ In a meta-analysis study, 63% of athletes returned to play after ACL reconstruction at their preinjury level, and fear of reinjury is the most frequently cited reason for reduction in sports participation.⁶ However, over 85% of athletes achieved clinically satisfactory outcomes in terms of knee laxity, muscle strength, and single-leg hop distance. As physical and psychological readiness to return to sports after an injury do not always coincide,^{14,54} fear of reinjury may prevent return to sports even with resolved symptoms and physical impairments. It is important for clinicians to recognize the influence of fear of reinjury of injured athletes to facilitate return to sport.

Intervention Options for Reducing Fear of Reinjury

It is becoming apparent that some athletes might require specific intervention for fear of reinjury to improve function and complete a successful return to sport. Current sports injury rehabilitation protocols focus on resolving physical impairments and do not directly address fear of reinjury. For example, the structure of most sports injury rehabilitation protocols is to resolve acute postinjury impairments (eg, pain, effusion, range of motion deficits, and muscle activation) followed by progression to advanced exercises that address remaining physical impairments, increase physical challenge, and mimic sport activities. This approach is successful for many athletes, but some athletes with high fear of reinjury might require specific intervention approaches to complete a successful return to sport, even when physical impairments are resolved.⁶

Psychologically informed practice has been advocated for patients with low back pain and may contain principles that are appropriate in the rehabilitation of athletes. This treatment approach requires measuring key psychological factors that are likely to affect outcome, including them as a treatment target, and providing a treatment that matches the needs of the patient. Successful interventions that have been used by physical therapists for the low back pain population^{82,90} include education to reduce fear-avoidance beliefs, quota-based exercise, and graded exposure. These interventions have also been used in patients with general chronic musculoskeletal pain⁴⁸ and knee osteoarthritis.⁷ Implementing psychologically informed practice

Table 2. Common psychosocial interventions

Intervention	Theoretical Basis	Selected Studies
Education	Better knowledge of process reduces anxiety	Francis et al ²⁵ O'Connor et al ⁶¹
Goal setting	Provides direction Specific, measurable goals Perception of increased treatment effectiveness	Vitali and Recupero ⁸³ Hamson-Utley and Vazquez ³¹ Evans and Hardy ²¹
Imagery	In rehabilitation setting, anticipation of pain Physiologic effect to reduce stress hormones	McKinney et al ⁵⁴ Cupal and Brewer ¹⁸ Maddison et al ⁵⁰
Self-talk	Help athletes recognize and change negative thoughts	Podlog et al ⁶³
Graded exposure	Expose patients to fearful situations to show no more harm	Woods and Asmundson ⁹⁵
Social support	Increased support enhances coping strategies	Rees et al ⁷⁰ Hogan et al ³⁶
Relaxation	Reduce tension and anxiety	Johnson ³⁷ Cupal and Brewer ¹⁸

in sports rehabilitation would require measurement of fear of reinjury as well as implementing the appropriate adjunctive interventions for athletes with high fear of reinjury.

The progressive nature of sports injury rehabilitation, particularly during advanced exercise, can be similar to graded exposure intervention. Briefly, graded exposure interventions involve progressive exposure to a hierarchy of situations or activities that cause fear for the purpose of showing that these can be completed without causing harm.⁴⁹ The primary difference is that exercise progression in rehabilitation is focused on the estimated application of biomechanical or physiological forces to healing tissue while exercise prescription for exposure is based on increasing situations or activities that cause fear or anxiety. Therefore, in order for rehabilitation exercise to become a graded exposure intervention, it is necessary to ascertain the activity that causes fear of reinjury and develop a hierarchy that increases exposure to the feared activity. It is possible that advanced exercise reduces fear of reinjury in some athletes by exposing them to challenging environments. However, a more direct approach for patients with high fear of reinjury is necessary to prescribe activities in a manner consistent with graded exposure and to prevent situations where athletes may be willing to do certain high-level activities but avoid others that are feared.

Many other cognitive behavioral interventions have been described as potentially beneficial during sports injury rehabilitation (Table 2). Santi and Pietrantonio⁷² and Schwab Reese et al⁷⁴ provided overviews of psychosocial interventions after athletic injury. It is challenging and beyond the purposes of this review to compare interventions because of methodological differences between studies, including the chosen outcome

measure (measuring reduction in psychological consequences, increase in psychological coping, reduction in reinjury anxiety, etc), number of interventions employed (single or multiple), and treatment parameters such as frequency and duration.⁷⁴ Despite these shortcomings, existing studies have shown techniques consistent with psychologically informed practice principles can improve coping skills^{21,51,52,71} and reduce reinjury anxiety.^{18,51,74}

SUMMARY

Fear of reinjury is a psychological response to sports injury that can negatively affect rehabilitation outcomes, including preventing a successful return to sport. Incorporating principles of psychologically informed practice into sports injury rehabilitation could improve rehabilitation outcomes for athletes with high fear of reinjury. One application of psychologically informed practice would be to measure fear of reinjury. Clinicians can use self-report questionnaires to quantify fear of reinjury but have to consider carefully the differences between existing questionnaires to make an appropriate selection. The timing of questionnaire administration is another consideration. Administering questionnaires at the start of rehabilitation provides insight into an athlete's baseline fear of reinjury levels; however, fear of reinjury levels may decrease during rehabilitation only to rise as return to sport is imminent. Therefore, it may be beneficial to measure fear of reinjury when an athlete begins advanced exercise or as part of a battery of tests for return-to-sport clearance. Another aspect of psychologically informed practice would be to include fear of reinjury as a rehabilitation target and provide intervention. Several interventions were presented that may reduce fear of

reinjury. Some interventions show success in other orthopaedic populations but still require testing in an athletic population. Other interventions have shown success in an athletic population, although the varied outcomes prohibit comparison. Future research can fill knowledge gaps to determine the best ways to address fear of reinjury in sports rehabilitation.

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