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**Perspective**

# Fear of Movement and Reinjury in Sports Medicine: Relevance for Rehabilitation and Return to Sport

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## Abstract

Athletes are defined by their ability to move and are often accustomed to pain as it relates to their sports and exercise regime. The forced movement restriction and pain associated with an acute or overuse injury has a profound effect not only on their physical abilities but also on their psychological well-being and social context. With the goal of returning to sport, the rehabilitation focus historically has been on recovery of physical attributes, but more recent research is addressing the psychological factors. This Perspective proposes that—according to the current evidence in sports medicine—the fear that affects choice of treatment, rehabilitation, and return to sports is intertwined with physical capacity and recovery of function. Past injury is also 1 of the main risk factors for a sports injury; therefore, fear of reinjury is not irrational. For an athlete, the fear related to a sports injury encompasses the fear of reinjury along with fear of not being able to return to the sport at their highest performance level—and the fear of having lifelong debilitating pain and symptoms. This Perspective reviews the evidence for the influence of fear of movement and reinjury on choice of treatment, rehabilitation, and return to sport and provides suggestions on how to address this fear during the continuum of treatment and return to sports.

**Keywords:** Achilles Tendon, Ligaments, Orthopedics, Sports, Sports Medicine, Tendon Injuries

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## Introduction

An athlete is defined as "a person who is proficient in sports and other forms of physical exercise."[1] The athlete's ability to be successful in competition is closely related to their physical capacity, that is, athletic ability. A sport-related musculoskeletal injury has an immediate impact on their ability to move and participate in sports. This forced movement restriction and the pain associated with an acute or overuse injury not only has a profound effect on their physical abilities but also on their psychological well-being and social context. For many athletes, an injury can be a life crisis because it will impact many aspects of life. They may need to reevaluate their life goals, for example, sports career or choice of future occupation. Their social life may be, especially for young athletes, centered around sports and, therefore, will be dramatically affected.[2] In addition, many athletes describe the injury has caused them to lose their athletic identity.[3] Padaki et al found that the stronger the athletic identity, the greater the emotional trauma of a sport injury in younger athletes.[4] So, it is not surprising that fear of a new injury has been identified as one of the most important factors for not returning to sports after an injury.[5–10]

For an athlete with a sport injury, the assumed end goal is to return to preinjury sport. Often the first question an athlete asks after an injury is about how quickly they can go back. There is a sense of urgency to return to sport. From the athlete's perspective, their self-perception and possibly livelihood is based on their ability to perform their sport. The decision about returning to sport has mainly been defined by the injury type and severity, the recovery of impairments, symptoms and function, and ability to tolerate the demands of the sport. Many return-to-sport criteria include test batteries assessing the physical skills required for sports.[11,12] Addressing an athlete's psychological readiness, including fear of reinjury, has lagged behind functional testing. It was not until the last 10 years that the return-to-sport recommendations after anterior cruciate ligament (ACL) injury included testing for psychological readiness.[11] The most commonly used outcome measure is the ACL-Return to Sport after Injury scale (ACL-RSI), which measures athletes' emotions, confidence in performance, and risk appraisal in relation to return to sports.[13,14] However, specific tools and guidelines for testing psychological readiness after other acute injuries, or more chronic overuse injuries, are either lacking or not well established. Kinesiophobia and fear of reinjury has mostly been studied in the context of ACL injury and most specifically after ACL reconstruction. More recently, studies have addressed the influence of fear for reinjury after various sport injuries, including Achilles tendon rupture and tendinopathies, ankle and shoulder instability, anterior knee pain, and femoroacetabular impingement.[15] This Perspective, based on our experience, will focus on ACL injury reconstruction and acute Achilles tendon ruptures as representative for acute traumatic sports injury, and Achilles tendinopathy for understanding the influence of fear on more chronic overuse type injury.

We propose, based on the current evidence, that in sports medicine the fear that affects rehabilitation and return to sports more often relates to fear of reinjury and is intertwined with physical capacity and recovery of function. The fear of reinjury has sometimes also been described as "reinjury anxiety," differentiating the psychological terms "fear" and "anxiety."[16,17] In a chronic overuse injury, the fear of reinjury may also be synonymous with fear of reoccurrence of symptoms and disability from the same injury. In this Perspective, we will use the term fear of reinjury to encompass all aspects of fear and anxiety of either reinjury or reoccurrence of injury. Fear can turn irrational, negatively influencing the athlete in all perspectives of life and hindering them to return to sports. On the other hand, having had an injury is one of the main risk factors for a sports injury, so having a fear of reinjury is not always irrational. The type of injury (acute vs chronic/overuse), the knowledge and experience of the injury, and the perceived urgency of returning to sport all influence the athletes' response to the injury. We propose that for an athlete, fear related to a sports injury can be divided into 3 parts: (1) fear of reinjury; (2) fear of having lifelong debilitating pain and symptoms, including the risk for early osteoarthritis development; and (3) fear of inability to return to sports and sports performance (Fig. 1). A consistent attribute across the various aspects of fear is the loss of the athletic identity causing isolation from their social context.[3,18,19] In this Perspective, we will review the evidence for the influence of fear of movement and reinjury on choice of treatment and rehabilitation and return to sport as well as provide suggestions on how to address this during the treatment and return-to-sports continuum.

## Fear Related to ACL Injury

Among sports injuries, ACL injury has been a primary focus, with approximately 25,000 published articles and more than 1000 randomized clinical trials. The incidence of ACL injuries is 81 per 100,000 in the general population,[20] with higher incidence in athletes and those 15 to 40 years old.[21] During the acute phase after injury, pain may be present, but the most important functional disabling factor is knee instability that can cause subluxations/giving-way and potential further injuries, resulting in insecurity, lack of confidence, and fear. The injury requires an extended rehabilitation, sometimes surgical treatment (ACL reconstruction), and results in significant limitations in leisure time and physical activity participation for at least 6 months. Up to one-half of those injured do not return to their previous level of sports participation.[22]

In the beginning of 2000, we described that a variety of factors affect return to sports after an ACL injury and proposed that psychological factors such as fear of reinjury might have a central role.[23] In 2005, we published the first study, to our knowledge, where fear of reinjury— measured with the Tampa Scale of Kinesiophobia (TSK)—was reported as the cause of not returning to sports in 24% of the patients after ACL reconstruction.[24] Later on, we presented that more than one-half of patients after ACL reconstruction who did not return to preinjury sport reported "fear of reinjury" or "not trusting the knee" as the main factors.[22,25] Fear of reinjury had previously been identified as an emotional response in athletes following injury[26] and as a reason for not returning to sports,[27,28] but fear had not systematically been evaluated. In 1998, Mohtadi developed the ACL deficiency quality of life questionnaire, which included 1 specific question addressing fear ("How fearful are you of reinjuring your knee?")[29]; that question was modified by Webster et al in 2008 with the addition of "by playing your sport" and included in the ACL-RSI.[14] Since 2005, more than 100 papers can be identified describing fear of reinjury in patients with ACL injury treated with or without reconstruction.

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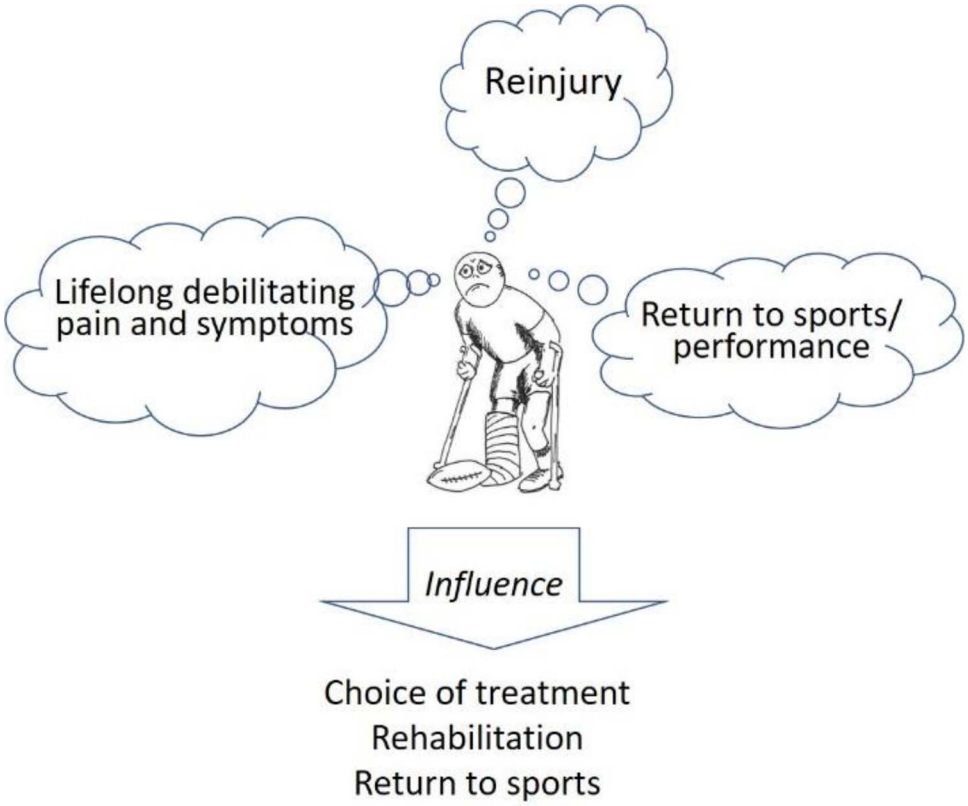



**Figure 1.** After a sport injury, the athlete may have (1) fear of reinjury; (2) fear of having lifelong debilitating pain and symptoms, including the risk for early osteoarthritis development; and (3) fear of inability to return to sports and sports performance. This fear will influence choice of treatment, rehabilitation, and return to sport.

Fear of reinjury is often highest following the initial impact of an injury and typically decreases with time after both non-surgical management and ACL reconstruction.[30–33] This effect may be in part due to resolution of physical impairments as rehabilitation progress, but other factors such as exposure to the activity may also be relevant. High fear of reinjury early after ACL reconstruction has a negative influence on the functional outcome and increases the odds of not advancing in rehabilitation.[33] Similarly, high fear of reinjury is associated with reduced self-reported knee function and having physical impairments at different timepoints after ACL reconstruction.[24,32–36] Still, many patients report good functional outcomes despite reporting high levels of fear that hinder them from performing their desired activities. Less research exists on fear of reinjury after non-surgical management of ACL injury, but also these patients report high levels of fear early after the injury. Those who eventually chose to have an ACL reconstruction report higher levels of fear compared with those who are managed without ACLR, 3 months after injury, despite no difference in patient-reported knee stability and function.[30,37]

Fear of reinjury is a factor for choosing surgical treatment of the ruptured ACL with the belief that surgical treatment will decrease the risks for new injuries, future problems with pain and symptoms, and osteoarthritis development.[38,39] Usually, if the patients want to return to contact and pivoting sports, ACL reconstruction should be the treatment of choice.[37,40,41] Unfortunately, even after ACL reconstruction, the risk for new injuries is high, and 1 in every 3 athletes sustains a new ACL injury (to the same or contralateral knee) within 3.5 years from ACLR if they return to contact sports.[42] High levels of fear of reinjury before ACLR or at the time for return-to-sport clearance also increased the risk for new ACL injuries (re-rupture or contralateral injury).[34,43] During the rehabilitation period after ACL reconstruction, many patients may realize the increased risk for new injuries and change priorities from desiring to go back to their preinjury sport to participating in less risky activities to avoid being injured. In these cases, fear of new injury is rational, directing the patient to make a decision that may hinder new injuries (ie, not return to contact and pivoting sports). Adaptation to a lower level of physical activity is also a factor that may decrease the risk for lifelong debilitating symptoms and development of osteoarthritis.[44]

## Fear Related to Achilles Tendon Injury

In other sports injuries, there is less research evaluating psychological factors, such as fear of movement/reinjury, and their effect on return to sport.[45] In addition, the main focus has been on acute injuries and less on athletic overuse injuries (often considered more chronic injuries), despite overuse injuries accounting for at least 30% of all injuries in collegiate athletes and a reason for discontinuing sports.[46,47] We have evaluated fear of movement using the TSK after both acute Achilles tendon rupture and overuse tendinopathy.[48–50] Despite both injuries being common in sports, the injury mechanism, symptoms, and impairments are distinctly different. Acute Achilles tendon rupture occurs during sports activity mostly without any forewarning or preceding symptoms and is accompanied with an acute pain,

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a loud pop, and immediate disability.[51] It is immediately clear to the athlete that this injury is severe, but there are surprisingly minor symptoms in the aftermath of the injury. Achilles tendinopathy, on the other hand, is a painful overuse injury that usually develops over weeks, or even months, with progressive increase in pain and symptoms up to the point where the pain is present with all sports and even daily activities.[52] As opposed to the acute rupture, Achilles tendinopathy is a more chronic injury that results in pain but has a lesser effect on function. The effect of the injury mechanisms and type of injury (acute vs chronic) can be seen when evaluating the psychological factors influencing the return to sport for these patients.

After an Achilles tendon rupture, the rate of return to play is reported to be 77%, with a range of 29% to 87%.[53] In elite sports such as American football and basketball, it is reported that 68% and 61% return to the league, respectively.[54,55] Fear or reinjury is described as a reason for not returning to sport.[9] One study reported that 30% of patients had the physical capacity to return to sport but chose not to.[10] The fear of returning to sport also seems closely related to the specific sport performed when injured. This results in patients stating they will never return to "that sport" but ultimately choose another sport or physical activity with similar demands on the Achilles tendon. At 3 months after injury (halfway through the rehabilitation), we found significant correlation between the level of kinesiophobia and physical activity, symptoms, and general health.[50] At the return-to-sport phase, pain is rarely a concern, but the limiting factor is either the lack of recovery of function or choosing not to return due to risk of reinjury.[9,50]

In patients with Achilles tendinopathy, pain is instead the cardinal symptom.[52] The initial signs of injury are often morning stiffness and pain after activity. As the injury progresses, the pain starts to limit sports activity and eventually even daily activities such as walking. The biggest fear for these athletes is to have an Achilles tendon rupture. Interestingly, those with painful Achilles tendinopathy rarely rupture (4%), and those with ruptures rarely have had any preceding symptoms.[56] Patients with Achilles tendinopathy do, however, have fear of movement, with 1 study reporting 38% of the patients having a high degree of kinesiophobia (>37 on TSK).[48] The degree of kinesiophobia (TSK) has also been found to relate to recovery of heel-rise function in patients with Achilles tendinopathy.[49] At baseline, those with high levels of kinesiophobia also had worse symptoms and quality of life, which is similar to patients with ACL injury.[24,32–34,36,48,57] However, we did not find any difference in the recovery trajectory between the patients of different levels of kinesiophobia, which is in contrast to the findings in patients with ACL injury.[33,57] The main concern for athletes with tendinopathy, however, is the high rate of reinjury/reoccurrence of symptoms (27% to 44%).[58,59] Reinjury/reoccurrence is also higher with short recovery periods.[60] It is reported that between 10% and 86% of patients with Achilles tendinopathy return to sports, but the definition for return to sport varies between studies; also, it is rarely reported if the patients are returning completely recovered and pain free.[61] The difficulty with overuse Achilles tendinopathy is that the rehabilitation may be painful while the cardinal symptom is also pain. The ability to be able to accept pain during the rehabilitation while also not ignoring the symptoms (no pain, no gain) is a delicate balance that might influence the choice of treatment, rehabilitation progress, and return to sports (Fig. 1).

With these specific examples, it is noticeable that fear of movement, fear of reinjury, and fear of pain and symptoms are interlinked and related to injury type (acute vs chronic), injury mechanism, and symptoms. Fear affects return to sports, and fewer athletes with high fear return to sports.[5,6,8,17,24,25,35,62] In turn, athletes typically struggle with fear about future pain and function and about their ability to perform in sports. To effectively treat and return the athlete back to sports, we need to understand and consider how these factors influence the choice of treatment and the rehabilitation process.

## Both "How" and "What" We Ask Matters

A recent systematic review[15] identified 34 patient-reported psychological assessment tools for evaluation of sport injury treatment outcomes, including 4 tools in the category "fear-avoidance response to pain." The most common way to evaluate fear of re-injury within sports medicine has been to use the TSK.[5] The question about fear can also be found in other questionnaires, for example, the ACL deficiency quality of life questionnaire[29] and the ACL-RSI,[14] or as project-specific questions.[43,63] The term kinesiophobia was introduced by Kori et al in 1990 as a view of chronic pain behavior.[64] They proposed that "chronic pain patients are victims of an insidious psychobehavioral process that gradually imposes an exaggerated set of fears and vulnerabilities related to the anticipation of painful reinjury" and that chronic pain behavior has more to do with phobic processes, that is "a kind of fear that is out of proportion to the reality of the situation, can neither be explained nor reasoned away, is largely beyond voluntary control, and leads to avoidance of the feared situation." With this definition, we may need to reconsider how correct the term kinesiophobia is for athletes being afraid of a new injury. With the outcome measures that we have today, we may oversimplify and miss the nuance of the fear spectrum. The fear athletes feel may be related only to the specific injury and possible reinjury and not pain per se and might not affect other parts of their life. They may not feel a fear of general movement other than specific movements that relate to their sport or to the trauma. The TSK includes general questions such as "People aren't taking my medical condition seriously enough" (q#5) and "Pain always means I have injured my body" (q#7) that may not indicate the sport-specific fear of reinjury. On the other hand, if we ask specifically "How fearful are you of reinjuring your knee,"[14,29] we may miss fear of future, more general disability. We may not have the answer of how to investigate fear, but it is important to be conscious about what construct we want to measure and how we measure it because it relates to how we interpret our results. In some cases, fear is relevant for the athletes. It may be time for the sports medicine community to develop a new construct to evaluate kinesiophobia and fear in athletes.

## Is the Fear Rational or Irrational?

For many athletes, return to sport is the highest priority, and the inability to return impacts their quality of life up to 20 years after ACL reconstruction.[64] Fear of reinjury has been identified as an important factor for not returning to sports after a sport injury.[5,9,17,22,24,25,35,50,62,66] A recent review

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shows that 2 in every 3 patients after ACL reconstruction report psychological factors as the reason for not returning to sports, and 77% of them reported fear of reinjury as the most important psychological factor.[5] In these cases, rehabilitation interventions should be directed to reduce this negative impact on the patient's life.

On the other hand, there is an increased risk for new injuries if the athlete returns to sports. Waiting for at least 9 months[67] or up to 24 months[68] after ACL reconstruction decreases the risk for reinjury. Fear decreases with time from injury,[30,33] and it is possible that the fear, instead of hindering patients, can be a motivator to achieve even better physical function and increase the intensity of their rehabilitation.

In overuse injuries such as Achilles tendinopathy, the symptoms at the early stages are morning stiffness and pain after activity. With some athletes' "no pain, no gain" attitude, these early symptoms are often ignored. It is often not until the pain becomes more chronic and limits the performance that the injury is acknowledged. At this stage, athletes with Achilles tendinopathy often express fear of having an acute Achilles tendon rupture. Because those with painful Achilles tendinopathy rarely experience rupture, the fear of having an acute rupture could be considered as irrational because it is unfounded.[56] On the other hand, having an acute Achilles tendon rupture is associated with difficulty returning to sport and previous performance level.[54,55] Both painful overuse tendinopathy and acute tendon ruptures are associated with retirement from sports, so the athlete's concerns and fear when injured are partly supported and rational.

## Choice of Treatment

Fear affects the choice of treatment. After an ACL injury, the athlete knows it will be at least 1 year before he/she returns to sports and therefore does not want to delay decisions about treatment path. In an overuse injury such as Achilles tendinopathy, the rehabilitation and recovery can also require up to 1 year depending on the severity.[52] Exercise therapy for overuse tendinopathy has the highest level of evidence but requires time.[61,69,70] The fear of losing out on playing sometimes causes the patient to seek out treatments promising to be quick fixes, such as orthobiologics, and the athlete may resort to more invasive treatments with no or minimal evidence.[71] In this case, the fear of not returning to sport fast enough may lead to questionable treatment choices. The search for quick fixes is generally not supported by what we know about tissue healing, however prevalent in sports medicine,[71] and can be linked to the fear of not returning fast enough to sport and previous performance level. The irony is that perceived urgency in finding quick fixes might lead to delayed recovery by initially ignoring the evidence-based treatments.

Treatment after a sport injury is a complex decision where many aspects must be considered.[72] Often the evidence is quite low for exactly what is the best treatment. For example, after both ACL injury and Achilles tendon rupture, both surgical and non-surgical treatment can have good results with patients being able to return to their preinjury sports.[73,74] Despite similar outcomes with surgical and non-surgical treatment after an Achilles tendon rupture, most athletes are recommended to have surgery despite the greater risk of complications such as infections and wound complications. After ACL injury, the risk of knee problems, reinjury, or injury to the other knee is high after both treatments, and osteoarthritis may develop within 10 to 15 years after both treatments. Adjusting physical activity levels and changing from contact and pivoting sports to sports with no contact and fast direction changing may decrease the risk of osteoarthritis.[44] In cases of complex decision making, the athlete and other stakeholders need to receive all possible information about advantage and disadvantage with each option that goes beyond the ability to return to sport quickly.[75]

For choice of treatment, the importance of giving information of options, the evidence of effectiveness, possible side effects and risks, and exploration of patient's preferences is important.[75] Directly after a sport injury, there are many negative emotions that may influence the course of rehabilitation[33] and may also influence patient's ability to make an informed decision. Other stakeholders, for example parents, may push for fast decisions such as surgical treatment without giving the time for the athlete to be deliberate in their decision. Patients describe that as time passes and function improves, they gain more confidence (and less fear) to perform in desired activities. There are perceptions of healing and relearning over time.[76] The reinjury rate decreases with longer recovery times after both ACL reconstruction and Achilles tendinopathy.[60,67] Giving the athlete time to overcome the psychological stress of an injury and allowing for the body's natural healing response might be the most crucial choice for successful treatment.[33]

## Rehabilitation Process and Return to Sports

Fear influences rehabilitation after a sport injury and needs to be addressed. Directly after an injury, there are often negative emotions, including fear. During the rehabilitation period, the "U-model" has been described, where emotions are negative from the beginning, become more positive during rehabilitation when the patient becomes more confident in their ability to perform and symptoms resolve, and then again turns more negative at the time the athlete begins to get ready for return to sport.[77] Athletes with low levels of fear of reinjury progress easier to more advanced phases of rehabilitation[33] and have the best functional outcomes after ACL reconstruction.[62] There is some evidence that less fear of reinjury enhances results of the physical rehabilitation.[33] Because fear of reinjury is related to physical performance,[31–35] rehabilitation focusing on physical impairment may also have an effect on decreasing fear of reinjury. Athletes report that enhanced physical capacity rebuilds trust in their capabilities and allows them to control risk levels. Muscle strengthening, sports-specific skills, and graded exposure helps athletes prepare the body and mind for return to sports.[78] Continued evaluations of strength and functional testing during rehabilitation are crucial in providing realistic understanding of the physical abilities after both acute and overuse injuries. This helps with motivation for rehabilitation and planning for return to sport. In addition, motivation is an important factor that predicts return to sport[25,79] and helps athletes overcome the fear of reinjury to return to sport.[78]

In painful overuse injuries such as Achilles tendinopathy, it has been useful to use a pain-monitoring model (Fig. 2) as guidance in knowing how to progress rehabilitation in the presence of pain.[80] The athlete often has difficulty balancing the "no pain, no gain" attitude with the fear of the pain indicating a lack of progress. The pain-monitoring model allows

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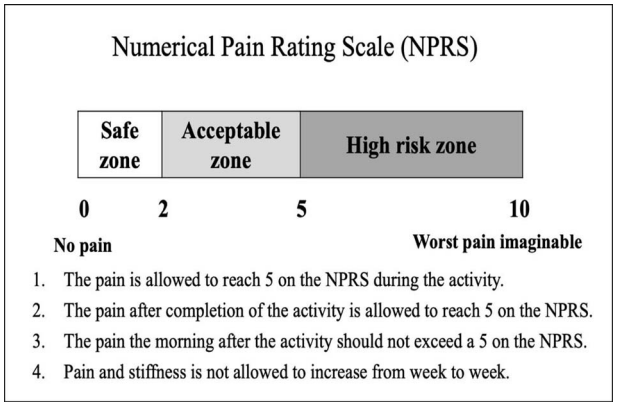



**Figure 2.** Pain-monitoring model.[85]

for an understanding of what is acceptable pain and also helps with the communication between the athlete and the treating clinician and other stakeholders. Combining this with evaluations of physical abilities helps to determine progress.[80] If the pain level stays the same with improvements of physical abilities, then it is clearer for the athlete to understand the progress and it may decrease the fear of the actual pain and symptoms.

In a meta-synthesis of qualitative research, we analyzed how biopsychosocial factors during recovery impact athletes' experiences and perceptions related to recovery and return to sport. We identified barriers and facilitators for physical and psychological recovery and summarized various aspects that athletes wanted to be included in the rehabilitation aimed at building their mental capacity.[81] Athletes with ACL injury had anxiety, felt fear of reinjury, and had low confidence in their knee. They wanted to have information so they could understand their injury and what is required for recovery. In agreement with shared decision making, we propose that information about the content and progression of the rehabilitation and expected realistic timelines for sports-specific rehabilitation and a return to sport should always be a part of the rehabilitation process in order to decrease fear. Athletes also want to learn strategies to help manage pain and injury risk. In a recent systematic review,[82] only 4 RCTs were identified that evaluated psychological interventions aiming to improve patient-reported outcomes. Two studies showed some evidence where guided imagery, visual imagery, and relaxation had a positive effect in reducing anxiety and fear of reinjury.[82] In a more recent qualitative study, Mahood et al described psychological and cognitive awareness skills, planning, and conscious preparation as helping athletes to address anxieties and negative thoughts.[78] More evidence in this area is needed. There are ongoing studies evaluating cognitive behavioral therapy, including techniques to reduce fear of reinjury and to improve recovery after ACL reconstruction,[83,84] and the future will show if these are effective. Other aspects that athletes value as fear reducing is support from important people[78] and the ability to set realistic and achievable goals.

## What Do We Suggest?

Fear of movement and reinjury were first described for patients with chronic pain. The concept is different when evaluating it in sports medicine. For athletes, the biggest concern is the fear of sustaining a new injury or a reoccurrence of the previous injury, lifelong debilitating pain and symptoms, and the risk of not being able to return to previous sport and perform at the same (or better) level as before the injury. As many athletes identify through their sport, injury has a great impact on many aspects of their life. In this Perspective, we present some areas influenced by the specific fear they are feeling. The athlete needs to make choices about the treatment they will receive and decisions about their immediate and future sport career and assess risk for future pain and disability. We suggest that the athlete needs time after the injury to make informed decisions. Fast decisions with early invasive and/or surgical interventions may be important for professional athletes who need to go back to work, but the majority of athletes who sustain a sport injury are not at the professional level. The healing capacity of the injured tissue and realistic timeframes for recovery need to be emphasized. Because there are usually many treatments with varying evidence available, the athlete needs to obtain the best available information about their injury, treatment choice, and what is required from them for recovery. The athlete may make the decision to quit sports, and in that way, minimize the risk of new injuries. Returning to a demanding sport will exponentially increase the risk of new injuries; therefore, the fear the athlete is feeling is relevant. In this case, it is important to motivate the athlete (or previous athlete) to continue being physically active but perhaps in less risky sports (activity modification). If the athlete decides to return to sport, all efforts must be made to reduce the fear of reinjury because fear itself can increase the risk for reinjury and affect rehabilitation progression, functional outcome, and the ability to return to sports. In addition, not being able to return to sport when the athlete's desire is to return will negatively affect long-term quality of life. Beyond high motivation to return to sports and adequate information, fear can decrease by systematic and adequate physical rehabilitation and regaining functional performance. Some evidence exists showing that psychological interventions such as visual imagery, relaxation, and cognitive awareness skills can decrease fear of reinjury, but more research is needed. Support from various stakeholders, such as coaches, friends, physical therapists, and doctors, and the ability to set realistic and achievable goals will also help the athlete to recover and eliminate debilitating fear.

## Author Contributions

Concept/idea/research design: J. Kvist, K.G. Silbernagel
Writing: J. Kvist, K.G. Silbernagel
Project management: J. Kvist, K.G. Silbernagel
Consultation (including review of manuscript before submitting): J. Kvist

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## References


1. Lexico O. Definition of athlete. 2021. Accessed October 21, 2021. https://www.lexico.com/en/definition/athlete.
2. Haraldsdottir K, Watson AM. Psychosocial impacts of sports-related injuries in adolescent athletes. *Curr Sports Med Rep*. 2021;20:104–108.
3. Burland JP, Toonstra J, Werner JL, et al. Decision to return to sport after anterior cruciate ligament reconstruction, part I: a qualitative investigation of psychosocial factors. *J Athl Train*. 2018;53:452–463.
4. Padaki AS, Noticewala MS, Levine WN, et al. Prevalence of posttraumatic stress disorder symptoms among young athletes after anterior cruciate ligament rupture. *Orthop J Sports Med*. 2018;6:2325967118787159.
5. Nwachukwu BU, Adjei J, Rauck RC, et al. How much do psychological factors affect lack of return to play after anterior cruciate ligament reconstruction? A systematic review. *Orthop J Sports Med*. 2019;7:2325967119845313.
6. Ardern CL, Taylor NF, Feller JA, Webster KE. A systematic review of the psychological factors associated with returning to sport following injury. *Br J Sports Med*. 2013;47:1120–1126.
7. Ardern CL, Webster KE, Taylor NF, Feller JA. Return to sport following anterior cruciate ligament reconstruction surgery: a systematic review and meta-analysis of the state of play. *Br J Sports Med*. 2011;45:596–606.
8. Ardern CL, Taylor NF, Feller JA, Webster KE. Fifty-five per cent return to competitive sport following anterior cruciate ligament reconstruction surgery: an updated systematic review and meta-analysis including aspects of physical functioning and contextual factors. *Br J Sports Med*. 2014;48:1543–1552.
9. Kaalund S, Lass P, Høgsaa B, Nøhr M. Achilles tendon rupture in badminton. *Br J Sports Med*. 1989;23:102–104.
10. Möller M, Movin T, Granhed H, et al. Acute rupture of tendon Achilles. A prospective randomised study of comparison between surgical and non-surgical treatment. *J Bone Joint Surg Br*. 2001;83:843–848.
11. Ardern CL, Glasgow P, Schneiders A, et al. 2016 consensus statement on return to sport from the first world congress in sports physical therapy. *Bern Br J Sports Med*. 2016;50:853–864.
12. Thomeé R, Kaplan Y, Kvist J, et al. Muscle strength and hop performance criteria prior to return to sports after ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2011;19:1798–1805.
13. Kvist J, Osterberg A, Gauffin H, et al. Translation and measurement properties of the Swedish version of ACL-return to sports after injury questionnaire. *Scand J Med Sci Sports*. 2013;23:568–575.
14. Webster KE, Feller JA, Lambros C. Development and preliminary validation of a scale to measure the psychological impact of returning to sport following anterior cruciate ligament reconstruction surgery. *Phys Ther Sport*. 2008;9:9–15.
15. Everhart JS, Harris K, Chafitz A, et al. Psychological assessment tools utilized in sports injury treatment outcomes research: a review. *J Sports Sci Med*. 2020;19:408–419.
16. Hsu CJ, Meierbachtol A, George SZ, Chmielewski TL. Fear of reinjury in athletes. *Sports Health*. 2017;9:162–167.
17. Truong LK, Mosewich AD, Holt CJ, et al. Psychological, social and contextual factors across recovery stages following a sport-related knee injury: a scoping review. *Br J Sports Med*. 2020;54:1149–1156.
18. Thing LF. "Voices of the broken body." The resumption of non-professional female players' sports careers after anterior cruciate ligament injury. The female player's dilemma: is she willing to run the risk? *Scand J Med Sci Sports*. 2006;16:364–375.
19. Podlog L, Dimmock J, Miller J. A review of return to sport concerns following injury rehabilitation: practitioner strategies for enhancing recovery outcomes. *Phys Ther Sport*. 2011;12:36–42.
20. Frobell RB, Le Graverand MP, Buck R, et al. The acutely ACL injured knee assessed by MRI: changes in joint fluid, bone marrow lesions, and cartilage during the first year. *Osteoarthr Cartil*. 2009;17:161–167.
21. Moses B, Orchard J, Orchard J. Systematic review: annual incidence of ACL injury and surgery in various populations. *Res Sports Med*. 2012;20:157–179.
22. Ardern CL, Osterberg A, Tagesson S, et al. The impact of psychological readiness to return to sport and recreational activities after anterior cruciate ligament reconstruction. *Br J Sports Med*. 2014;48:1613–1619.
23. Kvist J. Rehabilitation following anterior cruciate ligament injury: current recommendations for sports participation. *Sports Med*. 2004;34:269–280.
24. Kvist J, Ek A, Sporrstedt K, Good L. Fear of re-injury: a hindrance for returning to sports after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2005;13:393–397.
25. Faltstrom A, Hagglund M, Kvist J. Factors associated with playing football after anterior cruciate ligament reconstruction in female football players. *Scand J Med Sci Sports*. 2016;26:1343–1352.
26. Johnston LH, Carroll D. The context of emotional responses to athletic injury: a qualitative analysis. *J Sport Rehabil*. 1998;7:206–220.
27. Bjordal JM, Arnły F, Hannestad B, Strand T. Epidemiology of anterior cruciate ligament injuries in soccer. *Am J Sports Med*. 1997;25:341–345.
28. Mikkelsen C, Werner S, Eriksson E. Closed kinetic chain alone compared to combined open and closed kinetic chain exercises for quadriceps strengthening after anterior cruciate ligament reconstruction with respect to return to sports: a prospective matched follow-up study. *Knee Surg Sports Traumatol Arthrosc*. 2000;8:337–342.
29. Mohtadi N. Development and validation of the quality of life outcome measure (questionnaire) for chronic anterior cruciate ligament deficiency. *Am J Sports Med*. 1998;26:350–359.
30. Filbay S, Kvist J. Fear of reinjury following surgical and non-surgical management of anterior cruciate ligament injury: an exploratory analysis of the NACOX Multicenter Longitudinal Cohort Study. *Phys Ther*. 2021;12:pzab273. https://doi.org/10.1093/ptj/pzab273.
31. Chmielewski TL, Jones D, Day T, et al. The association of pain and fear of movement/reinjury with function during anterior cruciate ligament reconstruction rehabilitation. *J Orthop Sports Phys Ther*. 2008;38:746–753.
32. Hartigan EH, Lynch AD, Logerstedt DS, Chmielewski TL, Snyder-Mackler L. Kinesiophobia after anterior cruciate ligament rupture and reconstruction: noncopers versus potential copers. *J Orthop Sports Phys Ther*. 2013;43:821–832.
33. Chmielewski TL, George SZ. Fear avoidance and self-efficacy at 4 weeks after ACL reconstruction are associated with early impairment resolution and readiness for advanced rehabilitation. *Knee Surg Sports Traumatol Arthrosc*. 2019;27:397–404.
34. Paterno MV, Flynn K, Thomas S, Schmitt LC. Self-reported fear predicts functional performance and second ACL injury after ACL reconstruction and return to sport: a pilot study. *Sports Health*. 2018;10:228–233.
35. Lentz TA, Zeppieri G Jr, George SZ, et al. Comparison of physical impairment, functional, and psychosocial measures based on fear of reinjury/lack of confidence and return-to-sport status after ACL reconstruction. *Am J Sports Med*. 2015;43:345–353.
36. Burland JP, Howard JS, Lepley AS, et al. What are our patients really telling us? Psychological constructs associated with patient-reported outcomes after anterior cruciate ligament reconstruction. *J Athl Train*. 2020;55:707–716.
37. Grevnerts HT, Sonesson S, Gauffin H, et al. Decision making for treatment after ACL injury from an orthopaedic surgeon and patient perspective: results from the NACOX study. *Orthop J Sports Med*. 2021;9:23259671211005090.


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38. Grevnerts HT, Kvist J, Faltstrom A, Sonesson S. Patients focus on performance of physical activity, knee stability and advice from clinicians when making decisions concerning the treatment of their anterior cruciate ligament injury. *Int J Sports Phys Ther*. 2020;15:441–450.
39. Swirtun LR, Eriksson K, Renstrom P. Who chooses anterior cruciate ligament reconstruction and why? A 2-year prospective study. *Scand J Med Sci Sports*. 2006;16:441–446.
40. Diermeier T, Rothrauff BB, Engebretsen L, et al. Treatment after anterior cruciate ligament injury: panther symposium ACL treatment consensus group. *Knee Surg Sports Traumatol Arthrosc*. 2020;28:2390–2402.
41. Sommerfeldt M, Raheem A, Whittaker J, Hui C, Otto D. Recurrent instability episodes and meniscal or cartilage damage after anterior cruciate ligament injury: a systematic review. *Orthop J Sports Med*. 2018;6:2325967118786507.
42. Faltstrom A, Kvist J, Gauffin H, Hagglund M. Female soccer players with anterior cruciate ligament reconstruction have a higher risk of new knee injuries and quit soccer to a higher degree than knee-healthy controls. *Am J Sports Med*. 2019;47:31–40.
43. Tagesson S, Kvist J. Greater fear of re-injury and increased tibial translation in patients who later sustain an ACL graft rupture or a contralateral ACL rupture: a pilot study. *J Sports Sci*. 2016;34:125–132.
44. Neuman P, Englund M, Kostogiannis I, et al. Prevalence of tibiofemoral osteoarthritis 15 years after nonoperative treatment of anterior cruciate ligament injury: a prospective cohort study. *Am J Sports Med*. 2008;36:1717–1725.
45. Marusic J, Dolenc P, Sarabon N. Psychological aspect of rehabilitation and return to sport following lower limb injuries. *Montenegrin J Sport Sci Med*. 2020;9:59–64.
46. Yang J, Tibbetts AS, Covassin T, et al. Epidemiology of overuse and acute injuries among competitive collegiate athletes. *J Athl Train*. 2012;47:198–204.
47. Dauty M, Dupré M, Potiron-Josse M, Dubois C. Identification of mechanical consequences of jumper's knee by isokinetic concentric torque measurement in elite basketball players. *Isokinet Exerc Sci*. 2007;15:37–41.
48. Corrigan P, Cortes DH, Pontiggia L, Silbernagel KG. The degree of tendinosis is related to symptom severity and physical activity levels in patients with midportion Achilles tendinopathy. *Int J Sports Phys Ther*. 2018;13:196–207.
49. Silbernagel KG, Brorsson A, Lundberg M. The majority of patients with Achilles tendinopathy recover fully when treated with exercise alone: a 5-year follow-up. *Am J Sports Med*. 2011;39:607–613.
50. Olsson N, Karlsson J, Eriksson BI, et al. Ability to perform a single heel-rise is significantly related to patient-reported outcome after Achilles tendon rupture. *Scand J Med Sci Sports*. 2014;24:152–158.
51. Järvinen TA, Kannus P, Maffulli N, Khan KM. Achilles tendon disorders: etiology and epidemiology. *Foot Ankle Clin*. 2005;10:255–266.
52. Silbernagel KG, Hanlon S, Sprague A. Current clinical concepts: conservative management of Achilles tendinopathy. *J Athl Train*. 2020;55:438–447.
53. Zellers JA, Carmont MR, Grävare SK. Return to play post-Achilles tendon rupture: a systematic review and meta-analysis of rate and measures of return to play. *Br J Sports Med*. 2016;50:1325–1332.
54. Amin NH, Old AB, Tabb LP, et al. Performance outcomes after repair of complete Achilles tendon ruptures in national basketball association players. *Am J Sports Med*. 2013;41:1864–1868.
55. Parekh SG, Wray WH 3rd, Brimmo O, Sennett BJ, Wapner KL. Epidemiology and outcomes of Achilles tendon ruptures in the National Football League. *Foot Ankle Spec*. 2009;2:283–286.
56. Yasui Y, Tonogai I, Rosenbaum AJ, et al. The risk of Achilles tendon rupture in the patients with Achilles tendinopathy: healthcare database analysis in the United States. *Biomed Res Int*. 2017:2017;7021862.
57. Alghamdi NH, Pohlig RT, Lundberg M, Silbernagel KG. The impact of the degree of kinesiophobia on recovery in patients with achilles tendinopathy. *Phys Ther*. 2021;7:pzab178. Epub ahead of print.
58. Cook JL, Khan KM, Harcourt PR, et al. A cross sectional study of 100 athletes with jumper's knee managed conservatively and surgically. The Victorian Institute of Sport Tendon Study Group. *Br J Sports Med*. 1997;31:332–336.
59. Hägglund M, Zwerver J, Ekstrand J. Epidemiology of patellar tendinopathy in elite male soccer players. *Am J Sports Med*. 2011;39:1906–1911.
60. Gajhede-Knudsen M, Ekstrand J, Magnusson H, Maffulli N. Recurrence of Achilles tendon injuries in elite male football players is more common after early return to play: an 11-year follow-up of the UEFA champions league injury study. *Br J Sports Med*. 2013;47:763–768.
61. Magnussen RA, Dunn WR, Thomson AB. Nonoperative treatment of midportion Achilles tendinopathy: a systematic review. *Clin J Sport Med*. 2009;19:54–64.
62. te Wierike SC, van der Sluis A, van den Akker-Scheek I, Elferink-Gemser MT, Visscher C. Psychosocial factors influencing the recovery of athletes with anterior cruciate ligament injury: a systematic review. *Scand J Med Sci Sports*. 2013;23:527–540.
63. Ardern CL, Taylor NF, Feller JA, Webster KE. Fear of re-injury in people who have returned to sport following anterior cruciate ligament reconstruction surgery. *J Sci Med Sport*. 2012;15:488–495.
64. Kori SH, Miller RP, Todd DD. Kinesiophobia: a new view of chronic pain behavior. *Pain Management*. 1990;1:35–43.
65. Filbay SR, Ackerman IN, Russell TG, Crossley KM. Return to sport matters-longer-term quality of life after ACL reconstruction in people with knee difficulties. *Scand J Med Sci Sports*. 2017;27:514–524.
66. Ardern CL, Taylor NF, Feller JA, Whitehead TS, Webster KE. Psychological responses matter in returning to preinjury level of sport after anterior cruciate ligament reconstruction surgery. *Am J Sports Med*. 2013;41:1549–1558.
67. Grindem H, Snyder-Mackler L, Moksnes H, Engebretsen L, Risberg MA. Simple decision rules can reduce reinjury risk by 84% after ACL reconstruction: the Delaware-Oslo ACL Cohort Study. *Br J Sports Med*. 2016;50:804–808.
68. Nagelli CV, Hewett TE. Should return to sport be delayed until 2 years after anterior cruciate ligament reconstruction? Biological and functional considerations. *Sports Med*. 2017;47:221–232.
69. Sussmilch-Leitch SP, Collins NJ, Bialocerkowski AE, Warden SJ, Crossley KM. Physical therapies for Achilles tendinopathy: systematic review and meta-analysis. *J Foot Ankle Res*. 2012;5:15.
70. Andres BM, Murrell GAC. Treatment of tendinopathy: what works, what does not, and what is on the horizon. *Clin Orthop Relat Res*. 2008;466:1539–1554.
71. Cole BJ, Gilat R, DiFiori J, Rodeo SA, Bedi A. The 2020 NBA orthobiologics consensus statement. *Orthop J Sports Med*. 2021;9:23259671211002296–23259671211002296.
72. Hopwood M. The shared decision-making process in the pharmacological management of depression. *Patient*. 2020;13:23–30.
73. Grindem H, Eitzen I, Moksnes H, Snyder-Mackler L, Risberg MA. A pair-matched comparison of return to pivoting sports at 1 year in anterior cruciate ligament-injured patients after a nonoperative versus an operative treatment course. *Am J Sports Med*. 2012;40:2509–2516.
74. Holm C, Kjaer M, Eliasson P. Achilles tendon rupture–treatment and complications: a systematic review. *Scand J Med Sci Sports*. 2015;25:e1–e10.
75. Politi MC, Lewis CL, Frosch DL. Supporting shared decisions when clinical evidence is low. *Med Care Res Rev*. 2013;70:113S–128S.
76. Osterberg A, Kvist J, Dahlgren MA. Ways of experiencing participation and factors affecting the activity level after nonreconstructed anterior cruciate ligament injury: a qualitative study. *J Orthop Sports Phys Ther*. 2013;43:172–183.
77. Morrey MA, Stuart MJ, Smith AM, Wiese-Bjornstal DM. A longitudinal examination of athletes' emotional and cognitive responses


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to anterior cruciate ligament injury. *Clin J Sport Med*. 1999;9: 63–69.
78. Mahood C, Perry M, Gallagher P, Sole G. Chaos and confusion with confidence: managing fear of re-injury after anterior cruciate ligament reconstruction. *Phys Ther Sport*. 2020;45:145–154.
79. Gobbi A, Francisco R. Factors affecting return to sports after anterior cruciate ligament reconstruction with patellar tendon and hamstring graft: a prospective clinical investigation. *Knee Surg Sports Traumatol Arthrosc*. 2006;14:1021–1028.
80. Silbernagel KG, Thomeé R, Eriksson BI, Karlsson J. Continued sports activity, using a pain-monitoring model, during rehabilitation in patients with Achilles tendinopathy: a randomized controlled study. *Am J Sports Med*. 2007;35:897–906.
81. Ardern CL, Hooper N, O'Halloran P, Webster KE, Kvist J. Developing a psychological support intervention to help injured athletes get back in the game. *medRxiv*. 20212021.03.01.21252681.
82. Coronado RA, Bird ML, Van Hoy EE, et al. Do psychosocial interventions improve rehabilitation outcomes after anterior cruciate ligament reconstruction? *Sys Rev Clin Rehabil*. 2018;32: 287–298.
83. Coronado RA, Sterling EK, Fenster DE, et al. Cognitive-behavioral-based physical therapy to enhance return to sport after anterior cruciate ligament reconstruction: an open pilot study. *Phys Ther Sport*. 2020;42:82–90.
84. Ardern CL, Kvist J. BAck iN the game (BANG)—a smartphone application to help athletes return to sport following anterior cruciate ligament reconstruction: protocol for a multicentre, randomised controlled trial. *BMC Musculoskelet Disord*. 2020;21:523.
85. Silbernagel KG, Crossley KM. A proposed return to sport program for patients with midportion Achilles tendinopathy: rationale and implementation. *J Orthop Sports Phys Ther*. 2015;45:876–886.

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