THE RELATIONSHIP BETWEEN DISABILITY AND FEAR AVOIDANCE IN
ATHLETES WITH ACUTE MUSCULOSKELETAL INJURIES

by

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ABSTRACT

Advances in injury management and rehabilitation have helped reduce the physical recovery time needed for many athletes to return to sport. However, psychological readiness to return to sport should also be addressed and if left untreated has the potential to negatively affect return to activity. Increases in kinesiophobia have often been observed in a chronic injury population with little understanding of its potential impact on an acute injury population. The purpose of this study was two-fold: 1.) to examine the relationship between kinesiophobia and disability in athletes with acute musculoskeletal injuries and 2.) to describe potential psychological factors that contribute to the development of kinesiophobia in athletes if a relationship is established.

Methods: Twenty-five NCAA collegiate athletes (10 females, 11 males; age = 20.1±1.5) who incurred an acute musculoskeletal injury resulting in a loss of playing/practice time or alterations in participation status in conditioning, practice or game participated in this study. Participants completed a study packet that included a demographic questionnaire and 4 psychometrically sound instruments: 1.) Visual Analog Scale (VAS), 2.) Pain Catastrophizing Scale (PCS), 3.) Tampa Scale of Kinesiophobia (TSK-17), and the Disablement in the Physically Active Scale (DPA).

Results: The TSK-17 scores explained 37.6% of the variance in DPA scores. (r=.613, R²=.376, p=.001). VAS scores were only moderately related to TSK-17 scores (r=.373, R²=.141, p=.020), but were highly related to DPA scores accounting for 52.2% of the DPA score variance (r=.723, R²=.522, p<.001). VAS and PCS scores were not significantly able to explain variance in
the TSK-17 scores \( r = .467, R^2 = .226, F_{(2,22)} = 3.214, p = .060 \). The combination of VAS, PCS, and TSK-17 explained 68.7% of variance in DPA scores \( r = .829, R^2 = .687, F_{(3,21)} = 15.33, p < .001 \). *Conclusion:* The results suggest that kinesiophobia is present in an acute population, but cannot be entirely explained by the Fear Avoidance Model psychological constructs. However, The TSK-17 and VAS are useful tools to help practitioners understand an athlete’s disablement levels. Future research in this area is warranted to understand kinesiophobia in acute musculoskeletal injuries.
When an athlete is injured, he or she not only suffers from physical loss, but psychological loss as well. Some research indicates that as many as 19% of injured athletes report psychological distress levels similar to that of individuals diagnosed with mental health problems. Many athletes can develop potential anxieties or fears concerning return to sport and possible re-injury due to the physical trauma that occurs in most athletic injuries. Recent research has shed new light on psychosocial factors that can lead to the development of an irrational fear of movement or re-injury, termed kinesiophobia. Unintended consequences, such as fear avoidance, can develop and affect the readiness of an athlete to return to sport if not properly addressed. Currently most rehabilitation protocols primarily focus on the physical readiness of return to activity, but neglect to address the psychological component as the athlete progresses through rehabilitation.

A disablement model conceptually demonstrates the effect of an injury on body systems, functioning, and quality of life. Pain, a natural sequela of a musculoskeletal injury, is the most common disablement limitation that an athlete experiences when an acute injury occurs. Pain is a complex, multidimensional process that often time leads to fear avoidance of movements or activities. Fear avoidance is a behavior of avoiding activities that they perceive will cause pain. Pain-related fear is associated with decreased physical performance and increased disability. Kinesiophobia is a term developed from the fear avoidance model of chronic pain, which focuses specifically on the “irrational
and debilitating fear of physical movement. High levels of kinesiophobia can confound the treatment effect in rehabilitation. For example, ACL patients with high levels of kinesiophobia had less confidence in their injured knee despite objective and subjective restoration of stability. Additionally, fear of re-injury may be a significant predictor of postsurgical levels of activity and confidence in the ability to return to a sport effectively. Interestingly, most research regarding kinesiophobia and related psychological constructs has studied patients with chronic musculoskeletal conditions. However, even studies that observe chronic conditions indicate that kinesiophobia occurs in patients with acute musculoskeletal injuries and suggests that more research needs to be completed to understand this phenomenon.

The Fear Avoidance Model (FAM), which is commonly used as a theoretical framework in studies investigating chronic pain conditions, is useful in explaining the additional psychological factors that lead to the development of kinesiophobia. Several psychological factors included in the FAM are catastrophizing, pain-related anxiety, and pain-related fear. These constructs have helped to better understand the mechanism through which people can develop fearful tendencies. A study by Parr et al. found that multiple psychological constructs should be analyzed when dealing with a clinical population since their association with pain and disability might be construct specific. Often, individual psychological constructs are over looked, but it is especially important in an athletic population to differentiate between potential causes of psychological distress, since every athlete will respond differently to an injury.
Purpose

The purpose of this study is two-fold: 1.) to examine the relationship between kinesiophobia and disability in athletes with acute musculoskeletal injuries and 2.) to describe potential psychological factors that predispose an athlete to fearful tendencies using the Fear Avoidance Model\textsuperscript{15} as a guide to understanding the development of kinesiophobia in the same set of athletes. The first part of this study will establish whether a relationship exists among patient-reported disablement levels and kinesiophobia within 48 hours of injury in athletes with acute musculoskeletal injuries. The purpose of the second part of the study is to explore the potential factors that contribute to athletes developing fearful tendencies following an acute musculoskeletal injury.

Operational definitions

**Acute musculoskeletal injury:** An injury occurring to the joint, bone, or soft tissue that takes place at a specific frame in time (12-48 hours for this study) and with an identified mechanism of injury. This may include strains, sprains, fractures, and tears of various tissues in the muscular or skeletal systems.

**Chronic musculoskeletal injury:** an injury resulting to the musculoskeletal system from the repeated exposure to an injurious force not sufficient enough to cause an acute injury or may result from an acute injury, for whatever reason, doesn’t recover as expected.\textsuperscript{17}
Mild musculoskeletal injury: An injury occurring to a joint, bone, or soft tissue that results in restriction of student athlete’s performance for 1 or more calendar days beyond the initial injury.\textsuperscript{18}

Severe musculoskeletal injury: An injury occurring to a joint, bone, or soft tissue that results in restriction of student athlete’s performance for 10 or more calendar days beyond the initial injury.\textsuperscript{18}

Kinesiophobia: A condition in which a patient has an excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury.\textsuperscript{14}

Disablement: inability of a person to fulfill his or her desired or necessary social or personal roles.

Pain: an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.\textsuperscript{19}

Pain-related fear: a broad and general term that covers all kinds of fears related to pain.

Athlete: A person who participates in organized sports as governed by the National Collegiate Athletic Association.
**Pain self-efficacy:** One’s confidence in performing a particular behavior and overcoming barriers that relate to pain.

**Pain catastrophizing:** a negative cognitive–affective response to anticipated or actual pain and has been associated with a number of important pain-related outcomes.²⁰

**Delimitations**

1.) Division I and III college athletes between 18-25 will participate in the study.

2.) Injuries must be acute in nature. Chronic or mild traumatic brain injuries will not be accepted because they may have different psychological effects on a person. Any acute musculoskeletal injuries will be accepted if they fall within the allotted time frame and meet the definition of musculoskeletal injury.

3.) The number of participants enrolled in this study will be dependant upon the number of injuries sustained over a 3-month period.

4.) Only certified athletic trainers will be making treatment and rehabilitation decisions for the first 48 hours which will decrease differences in management of acute musculoskeletal injuries

5.) Only student athletes participating in NCAA sanctioned sports will be included in this study which may create results that would be different from a recreationally active population.
Limitations

1.) This study is limited to athletes at Texas State University and Texas Lutheran University

2.) The amount of participants enrolled in the study are based on injury rates and consent

3.) Differing external stressors cannot be controlled, which may affect the results reported by the scales due to the psychological bias of each individual scale

4.) The type of sports included in this study will be limited to the NCAA sports offered at Texas State University and Texas Lutheran University

Assumptions

1.) It is assumed that all participants will be honest and complete surveys to the best of their ability

2.) It is assumed that the participant will understand the wording of the surveys

3.) It is assumed that data will be collected after 12 hours of injury but within 48 hours will yield enough data to allow for adequate statistical analysis

Significance of the Study

This study is unique because the relationship between kinesiophobia and disability following an acute musculoskeletal injury in an athletic population has yet to be established. We hope to answer several questions with this study to provide a higher standard of care for athletes by helping clinicians to understand the psychological component of rehabilitation in patients with kinesiophobia. Additionally, we seek to
better understand several common psychological factors established in patients with chronic pain conditions and observe their prevalence in athletes with acute musculoskeletal injuries. Kinesiophobia and pain self-efficacy have been suggested to be potential silent predictors for the development of pain issues and higher reported levels of disability. This is the first known study to look at the existence of these factors in an acute population and is an important first step in understanding the relationship between psychological and acute physical components of injury.
References


CHAPTER 2
LIRURATURE REVIEW

Introduction

Involvement in sports and physical activity has always had an inherent risk for injury. Multiple studies have demonstrated the risk for injury in high school and collegiate athletes. Over the past several years increases in physical activity and sports participation have resulted in a higher incidence of sports injuries. While many advances have been made to better understand and treat the physical aspect of injuries, often times the psychological components of an injury go untreated or their effects are under estimated. Pain perception and fear are two psychological components, which are believed to affect the quality of life and recovery from injury. Following an injury, transitional issues related to perceptions and concerns about competence, readiness, and autonomy are important factors with athletes in viewing themselves as successfully returning to sport.

The Fear Avoidance Model (FAM) is commonly used in many studies to help explain the development of chronic pain through specific psychological factors. As clinicians it is important to understand and recognize potential psychological constructs that can predispose an athlete to fearful tendencies. Currently it is reported that thirty-two percent of patients with acute ankle sprains and twenty percent of wrist fractures experience chronic pain after 7 years. Others have reported that up to seventy-four percent of ankle sprain patients will experience chronic pain after 4 years. The concerning notion is that both of these injuries are considered to be non-complicated to rehabilitate, and yet almost 1/3 of all ankle sprains and 1/5 of wrist fractures develop
chronic pain symptoms. This shows that despite improvements in physical status, the existence of chronic pain still persists in a large portion of patients. In fact, fear of pain has a larger effect on perceived disability than any physical or biomechanical problems. The FAM is composed of many constructs that are all inter-related in the development of fearful avoidance. Catastrophizing, anxiety, and kinesiophobia are three psychological constructs that have been identified as predictors of disabilities in patients with musculoskeletal and chronic lower back pain. Each of these constructs has been identified in patients with chronic pain conditions as potential predictors for why some patients develop chronic pain syndromes. It could be inferred that an athlete with high levels of one or all of these constructs is more likely to develop fearful tendencies and chronic problems with pain. Current research points to fear of movement/re-injury and self-efficacy to be strong predictors of disablement outcomes. However, after a review of the literature, a clear pattern or single factor does not emerge as the main cause of change. Therefore, additional assessments of potential psychological predictors are needed.

**Fear Avoidance Model**

Pain is a universal experience that happens to everyone at some point during their lifetime. Pain is composed of two basic components: a sensory-discriminative and motivational-affective dimension. The sensory-discriminative is primarily physiological in nature and is dependent upon biological pathways and the frequency of nociceptive stimulation within a person. Comparatively, the motivational-affective dimension is
primarily psychological and is perceived by similar principles that dictate all types of emotional behavior.\textsuperscript{6} Pain is a complex psychological and physiological process that naturally occurs to prevent further injury or harm to our bodies in the short time following an injury. However, few individuals that experience acute pain will develop chronic pain.\textsuperscript{8} While the exact mechanism for developing chronic pain is unknown, pain related fear and avoidance are potential routes for understanding chronic pain problems.\textsuperscript{14} Additional mechanisms may include misinterpretations of bodily sensations, inaccurate predictions about pain, hypervigilance, physical deconditioning processes, and muscular reactivity.\textsuperscript{14}

While pain-related fear can occur through various cognitive and physical routes, it may also be associated with learning.\textsuperscript{8} A recent study showed the link between the acquisition of fear through an associative learning process.\textsuperscript{8} This supports the notion that during an injury, a person could have learned to associate the perception of pain through a task or movement, when in fact no biological or nociceptive pathways are stimulated. Initially following an injury, a person will experience the greatest mood disturbances associated with pain including anxiety, anger, fear, and confusion.\textsuperscript{4} However, the development of complications with pain is an intricate multidimensional process including various psychosocial factors that influence pain perception and the possibility of acute pain becoming chronic in nature.\textsuperscript{15}

According to Linston and Vlaeyen\textsuperscript{15} there are two extreme coping mechanisms in response to pain, confrontation or avoidance. A person who responds by confronting his or her fear typically experiences a reduction in fear over time, but someone who avoids
fear will usually exacerbate and maintain fearful tendencies and in extreme cases develop a phobia. Individuals who view their pain as temporary and make adaptive responses are more motivated and likely to confront their pain and recover from it. Additionally, a number of psychosocial factors will effect how a person manages a painful experience, either by confronting or avoiding, including pain history, personal coping strategies, stressful life events, and characteristic behavior patterns.

Lethem et al. was the first to introduce the activity avoidance model as a way to explain why some people recover from painful injuries, where as others who exhibit pain-related behaviors and cognitions develop chronic pain (see figure1). Experiences of extreme pain involve both pain sensation and emotional reactions and one or both components can cause a person to develop a fear of pain. This model primarily focused on classical and operant conditioning paradigms to explain why a person will develop avoidance behaviors. As more pain research pain was conducted, Linston et al. proposed an updated model with new integrated psychological components, which would later be known as the FAM (see figure 2). It included additional variables that contribute to the cycle of fear and avoidance behaviors, which include pain-related fear, pain-related anxiety, and pain catastrophizing. The activity avoidance model is less commonly used because it is primarily based on Pavlov’s conditioning principle to explain the cause of chronic pain where as the FAM uses commonly seen psychological markers from patients with chronic pain.

Pain-Related Fear

Pain-related fear includes the fear of pain sensation, fear of movement or re-injury, and fear of physical activities that are assumed to cause pain. People with pain-
related fear believe activities will cause them pain, and as a result tend to avoid movement, which only perpetuates the problem. For example, a study by Fritz et al\textsuperscript{19} investigated the role of fear avoidance in patients with acute lower back pain and found a correlation between disability scores and work and physical activity subscales in the Fear Avoidance Beliefs Questionnaire ($r = .40$ and $r = .34$ respectively). Additionally, they propose that fear avoidance beliefs may be the most specific and powerful cognitive factor in explaining work absence in patients with low back pain.\textsuperscript{19} Numerous studies also support an association of pain-related fear with disability in patients with chronic and acute lower back pain,\textsuperscript{20} hip,\textsuperscript{18} and foot and ankle dysfunction.\textsuperscript{10} Even in healthy patients, a fear of pain was a key psychological construct in predicting pain intensity prior to an injury occurring.\textsuperscript{21}

\textit{Pain-Related Anxiety}

An additional component described in the FAM is pain-related anxiety, which is closely associated with fear in its clinical presentation. Often times in literature the term fear and anxiety are used interchangeably. While there is a distinct theoretical difference between the two, it is hard to differentiate them clinically when a perceived threatening stimuli exists.\textsuperscript{9} Anxiety is defined as a future oriented affective state in which the source of the threat is elusive without a clear focus. Conversely, fear is an emotional reaction to an identifiable threat associated with a behavioral response. Typically fear causes defensive behaviors such as fight or flight, while anxiety is associated with preventative behaviors like avoidance and hypervigilance.\textsuperscript{18} The close relationship between pain-related fear and pain-related anxiety may blur the lines between an actual versus expected stimulus.\textsuperscript{18} As a result the updated FAM theorizes that pain-related anxiety and pain-
related fear are two distinct entities that are interrelated and can be the mechanism of fear avoidance. The addition of an anxiety construct shows that both components compound each other and lead to a behavioral pattern of avoidance or escape. People who suffer from pain typically describe fear of work related activities, fear of movement, fear of re-injury, and fear of pain as commonly occurring thoughts.

*Pain Catastrophizing*

Evidence continues to shows the association between the existence of pain catastrophizing and increased disability in a general population. The term catastrophizing was originally developed to describe the process in which anxious patients focus on the most extreme consequences conceivable. However, pain catastrophizing, as described by the FAM, focuses on how an individual responds to actual or an impending painful experience. Patient who catastrophize ruminate on pain sensations, exaggerate the threat of pain, and negatively self-evaluate the ability to deal with pain. High levels of catastrophizing have been associated with higher reported disability and appear to exist with higher reported intensity of pain as well in various conditions including generalized back pain, herpetic neuralgia, spinal cord injuries and psychological distress.

There has been a positive relationship found between pain catastrophizing and pain perception in healthy individuals. Beneciuk et al. observed several FAM factors, including pain catastrophizing, pain-related fear, kinesiophobia, and anxiety, by performing several neurodynamic tests for the median nerve. All the psychological variables explained 18.2% (p=.02) of variance in scores with pain catastrophizing alone contributing significantly to the model (β= .44, p < .01). This study suggests that non-
stimulus may be associated with painful stimulus, and pain catastrophizing is a better predictor of intensity of both painful and non-painful stimulus compared to other FAM factors.

Pain catastrophizing causes a person to have negative thoughts on pain, pain severity, and is related to psychological distress. However, defining the exact criteria for catastrophizing has not been explicitly stated. The general consensus is that it is an exaggerated negative orientation towards negative stimuli. It was not until 1987 when a three-factor model was proposed to measure the existence of catastrophizing that emphasized magnification, rumination, and helplessness. Based on previous research it was found that tendencies of increased attention, focus on pain-related thoughts, exaggeration of the threat value of painful stimuli, and adoption of a helpless orientation to coping with painful stimuli existed in people who catastrophize. Subsequently the Pain Catastrophizing Scale (PCS) was developed as way to measure potential risk for developing catastrophic thinking. Rumination accounted for 41% of variance, magnification accounted for 10% variance, and helplessness accounted for 8% variance in catastrophizing scores. The Cronbach alphas measuring the internal consistency of the PCS subscales were 0.87, 0.60, and 0.79 for rumination, magnification, and helplessness subscales respectively with an overall $\alpha$ of 0.87. In summary, the overall statistics indicate that the PCS is a reliable and valid measure of catastrophizing as scores were significant predictors of emotional distress.

Although the FAM is a model based on chronic pain conditions, Linston et al described it as “an attempt to explain why and how some patients with acute pain develop a substantial psychological overlay while others do not.” Other studies have shown that
pain beliefs exist in pain free patients based on their experiences, personality traits, or observational learning, which could predispose them developing pain based fear beliefs following an injury. The psychological constructs discussed in this section could be one possible explanation for how individuals develop high levels of kinesiophobia and disability during the acute stages of an injury. If these factors are left untreated or neglected during rehabilitation they could become a leading cause for the development of chronic pain and disablement.

From Vlaeyen et al.\textsuperscript{15}

Figure 1: Activity Avoidance Model
From Alappattu et al.\textsuperscript{18}

Figure 2: Fear Avoidance Model

**Kinesiophobia**

Pain-related fear has been indicated in a chronic population as predictor of disability\textsuperscript{13, 20, 26} even more than biomechanical status and pain intensity.\textsuperscript{7, 12} Developing a fear of pain is a future predictor of health status and can be more debilitating than the pain itself.\textsuperscript{7} In 1990 Kori, Miller, and Todd\textsuperscript{27} developed the term “kinesiophobia” to better define fear of movement and re-injury as specific components in the causal link to chronic pain as explained through the FAM. Kinesiophobia is defined as “a condition in which a patient has an excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury”.\textsuperscript{7} Patients who develop fearful tendencies may lack the ability to consciously reflect pain to
the proper area, and instead perceive their disability as a repercussion of their pain instead of a fear of movement or re-injury.\textsuperscript{9, 28}

Kinesiophobia has been measured in patients with chronic lower back pain,\textsuperscript{29, 30} post-operative ACL,\textsuperscript{31, 32} and post-operative shoulder.\textsuperscript{33, 34} Pain intensity and physical impairments, such as limited ROM or a diminished straight leg raise, are poor predictors of transition to chronic pain, but conversely studies have shown psychosocial factors are a much better predictor of disability.\textsuperscript{19} A follow-up study of 117 ACL patients found that only 53\% of patients returned to their pre-injury activity levels 3-4 years after ACL construction.\textsuperscript{32} Twenty-four percent of patients reported the cause for not returning to sport was due to the fear of re-injury, while those who returned to pre-injury activities had less fear of movement as measured by the Tampa Scale of Kinesiophobia (TSK).\textsuperscript{32} Additional studies also report similar findings with higher scores on the TSK-11 leading to lower self-reported knee function and return to sport rate.\textsuperscript{32, 35} These studies on the ACL show the importance of addressing the psychological component of an injury, since being “physically” healed doesn’t correlate to being psychologically ready for the same level of activity. Further evidence is shown through a randomized control trial demonstrating that a behavioral treatment protocol was more effective than an exercise-based physical therapy intervention in controlling pain-related disability, pain intensity, and fear of movement/re-injury.\textsuperscript{13}

A majority of the research done on kinesiophobia has been conducted in patients with low back pain (LBP) in the acute\textsuperscript{10, 19} and chronic\textsuperscript{29, 30} stages. One very important take away from a majority of these studies is that pain related behaviors can be adaptive in the acute stage of injuries, and potentially worsen in the case of long lasting pain
exacerbating disability and pain threshold. Further evidence shows that development of kinesiophobia is not an innate human reaction, but instead other psychological triggers must cause a person to develop a fear. A study by Leeuw et al. took two implicit measures of fear of movement/re-injury in patients with chronic LBP and healthy individuals. Implicit measures are evaluations or associations that are automatically activated without awareness or control of the individual. Their study showed that neither the chronic LBP group nor the control group demonstrated implicit fear of movement/re-injury despite a significant difference in self-reported measures of fear of movement/re-injury. However, despite these positive findings it should be noted that these implicit measures have poor reliability before they were modified to fit these more complex domains. Nonetheless, it is an important research step that demonstrates it is not a natural sequela for humans to develop fears without additional predisposing factors.

There is evidence to support the low relationship between pain severity and disability in chronic pain patients, leading to the notion that other variables must affect a person’s disability status. Research points to pain-related fear being more debilitating than pain itself, which relates back to the FAM illustrating kinesiophobia as a byproduct of fear of pain. Fear-avoidance beliefs may be especially prevalent when the acute pain problem is sudden and traumatic in nature, which is demonstrated by higher TSK scores in patients with sudden onsets of injury than those with gradual onsets. Most acute athletic injuries are sudden in nature, which makes the athletic population a potentially vulnerable group for developing kinesiophobia. Additionally, kinesiophobia may be amplified through interrelated psychological constructs including catastrophizing, anxiety, and self-efficacy.
Multiple questionnaires have been developed to measure kinesiophobia, but the TSK has demonstrated the best psychometric properties of all the instruments. The TSK has been validated in patients with chronic lower back pain, acute back pain, osteoarthritis, and fibromyalgia. It also has been shown to be a predictor in distress, disability, and persistence with behavioral tasks such as lifting weights and cardiovascular exercises.

The TSK was originally designed by Kori et al. as a 17-question form to measure fear of movement/re-injury in chronic pain patients. Each item is scored on a 4-point Likert scale with possibilities ranging from “strongly disagree” (score=1) to “strongly agree” (score=4) with items 4, 8, 12, and 16 reversely scored. Total points can range from 17-68 with higher scores reflecting greater fear of re-injury. The original 17-question model introduced by Kori et al. was subsequently found to have a four-factor structure labeled harm (3 items), fear of re-injury (2 items), importance of exercise (3 items), and avoidance of activity (4 items). However, a different 2-factor structure of activity avoidance (8 items) and somatic focus (5 items) was found to hold similar psychometric properties across two tested pain syndromes: chronic lower back pain and fibromyalgia.

The TSK has been evaluated by numerous studies all of which validate the TSK to be a reliable measure for kinesiophobia. However only Swinkels-Meewisse used the TSK to evaluate kinesiophobia in acute injuries. The original 17-item questionnaire was found to have an adequate internal consistency (α=.70 to .76), but slightly better consistency (α=.80 to .80) was found when removing the inversely scored questions (4,8,12,16). The test re-test measures show slightly higher scores with
removal of the inversely score items (r= .79), when compared to all items (r= .78).\textsuperscript{20} The validity of the TSK was established through a correlation between TSK scores and Fear Avoidance Belief Questionnaire (FABQ) scores. The FABQ is a well established and validated\textsuperscript{44} two-factor questionnaire looking at fear avoidance beliefs in work related activities and physical activity using a 7-point Likert scale.\textsuperscript{20} It is a resource used by clinicians to help to determine if a person is changing their lifestyle and behavior due to a fear of creating or worsening pain. These correlations revealed a validity of r=.39 to .59 with all items and r= .38 to .59 with the removal of inverse questions.

An 11-item questionnaire (TSK-11) was developed using the original 17 questions from the TSK. The TSK-11 was shown to have a reliability of $\alpha= .64$ to $.80$\textsuperscript{43} depending on the population measured. The TSK-11 removed the four inversely scored questions plus two additional items that were found to have a lower correlation to what they were designed to measure. However, for this research experiment we will use the 17-question TSK that will allow for analysis of all questions and the 11-questions when running statistical analysis.

**Disablement**

Evidence-based practice is often incorporated into clinical practice by using patient values, clinical expertise, and the best available evidence to make treatment decisions for patients.\textsuperscript{45} However, often times patient oriented evidence that matters, which focuses on identifying the effect of the disease on a health status, is overlooked for disease oriented evidence that focuses on the cause, pathology, mechanism of disease development, progression, and prognosis.\textsuperscript{45} It was not until 1965 when Nagi introduced
the first disablement model and recognized the influence of family, social, and community factors could all influence disability. The Nagi model was successfully able to change the perception of disability from strictly physical limitations to a broader understanding of an individual and their environmental interactions.

The Nagi model contains four components: active injury, impairments, functional limitations, and disability. The active injury is defined as being at the cellular level and describes the damage or disruption to a body part. An example of an active injury would be if an athlete suffers an ankle sprain during practice and experiences pain and inflammation immediately after. Impairment is the loss or abnormality of the tissue, organ or body system and includes signs and symptoms. With inversion ankle sprains, a common effect of the injury is decreased ROM specifically inversion and dorsiflexion if it is an inversion ankle sprain, and the loss in ROM would be considered an impairment. Functional limitations are characteristics about an individual as a whole, particularly in regards to social roles and daily activities. Disability is defined as the inability of a person to fulfill his or her desired or necessary social or personal role. A functional limitation that may exist from an inversion ankle sprain is being unable to perform a squat and a disability occurring if that person is held out of lifting weights with their team. Nagi’s original model has undergone adaptations by several other groups including the Institute of Medicine and World Health Organization, but conceptually the main pathway to disablement remains distinct through 3 interrelated components: impairments, functional limitations, and disability.

Disabilities as a result of injuries are developed through the disablement process, but this process is avoidable despite the existence of any impairments, conditions, or even
In fact, disability is preventable with many disability-prevention models assuming it can be prevented at any point through a conditions natural progression.\textsuperscript{49,50} Many studies cited a potential link between psychological factors including self-efficacy,\textsuperscript{10,11} fear of movement and reinjury,\textsuperscript{13,14} and catastrophizing\textsuperscript{12} as predictors of disability in chronic musculoskeletal pain and lower back pain.\textsuperscript{51} Following an injury, psychological changes are only heightened due to the trauma and stress now introduced into the athlete’s life. Empirical research largely supports the notion that personal and situational factors will effect the athlete’s cognitive appraisals, which in turn influence emotional and behavioral response to injury.\textsuperscript{6}

There is overwhelming evidence\textsuperscript{36,52,53,54} to support a relationship between levels of kinesiophobia and perceived levels of disability in chronic conditions. However, it is unclear if kinesiophobia is a risk factor independent from catastrophizing, depression, and other factors.\textsuperscript{52} There is evidence to suggest a high interrelation among psychological factors, such as kinesiophobia and catastrophizing, which explain a large part of variance in patients disability with similar limitations.\textsuperscript{52} Since psychological factors are a powerful predictor of disability, it suggests that pain related fear is a likely cause for activity avoidance and increased disability not as a consequence of it.\textsuperscript{12}

Following an acute musculoskeletal injury, psychological changes happen immediately and can last much longer than anticipated if not addressed by the clinician. One study used healthy patients and put them through a shoulder injury protocol that involved eliciting a maximal voluntary contraction both concentrically and eccentrically to simulate a shoulder injury. They found that catastrophizing and kinesiophobia did not significantly change over a short duration following the study, and those two variables
are extremely predictive of pain and disability following an injury.\textsuperscript{21} This shows how quickly an athletes psyche can change following injury, which can lead them to a negative thought process.

Until recently no measure existed to effectively examine disability in physically active populations. Vela and Deneger developed the Disablement in the Physically Active (DPA) scale\textsuperscript{55} to better measure patient-reported outcomes in an active population because many other disability measures were not designed to measure specific problems after a musculoskeletal injury.\textsuperscript{55, 56} The DPA scale is derived from the disablement framework that measures impairments, functional limitations, and disability. Additionally, the scale includes health related quality-of-life constructs to measure psychological effects of injury on the patient.\textsuperscript{57}

The DPA was developed with a 4-factor structure including at impairments, functional limitations, disabilities, and health-related quality-of-life (HRQOL). Several fit indices were used to measure the goodness of fit to the measurement model and revealed an acceptable 4 factor structure of the instrument (CMIN/DF=1.89, GFI= 0.852, TLI= 0.924, and CFI= 0.937). Validity was established through an inverse relationship between individual DPA and patient reported global functioning scores in acutely injured patients ($r=-0.751$, $P>.001$). The DPA demonstrated internal consistency ($\alpha=0.908$ to 0.890) and reliability with intraclass correlation value of 0.943. The area under the curve (AUC) value indicates the test’s ability to discriminate a meaningful change in participants. The AUC for the DPA ranged between 0.895(911 (95% confidence interval=.78, 1.00; $P>.001$) and 0.911 (95% confidence interval=.79, 1.00; $P>.001$). Finally the minimal clinically important difference value was found to be 6 points in chronic patients and 9
points in acute patients.
References:


13. Asenlof P, Soderlund A. A further investigation of the importance of pain
cognition and behavior in pain rehabilitation: longitudinal data suggests disability
and fear of movement are most important. *Clinical Rehabilitation* 2010; 24: 422-
430.

14. Vlaeyen JWS, Kole-Snijders AMJ, Boeren RGB, Van Eek H. Fear of
movement/(re)injury in chronic low back pain and its relation to behavioral

15. Vlaeyen JWS, Linton SJ. Fear avoidance and its consequences in chronic

16. Tripp DA, Stanish W, Ebel-Lam A, Brewer BW. Fear of reinjury, negative affect,
and catastrophizing predicting return to sport in recreational athletes with anterior
cruciate ligament injuries at 1 year post surgery. *Sports, Exercise, and

17. Linton SJ, Buer N, Vlaeyen, JWS, Hellsing AL. Are fear-avoidance beliefs
18. Alappattu MJ, Bishop MD. Psychological factors in chronic pelvic pain in 
women: relevance and application of the fear avoidance model of pain. *Physical 

19. Fritz JM, George SZ, Delitto A. The role of fear-avoidance beliefs in acute low 
back pain: relationships with current and future disability and work status. *Pain* 
2001; 94: 7-15.

Fear of movement/(re)injury, disability and participation in acute low back pain. 

Pain-related fear and catastrophizing predict pain intensity and disability 


23. Beneciuk JM, Bishop MD, George SZ. Pain catastrophizing predicts pain 
intensity during a neurodynamic test for the median nerve in healthy participants. 

24. Cano A, Leonard MT, Franz A. The significant other version of the Pain 


46. Snyder AR, Parsons JT, Valovich McLeod TC, Bay RC, Michener LA, Sauers EL. Using disablement models and clinical outcomes assessment to enable


CHAPTER 3

METHODS

Participants

The participants in this study were collegiate athletes between the ages of 18-24 participating in an NCAA sanctioned sport at a Division I or Division II university. Due to the nature of this study, only English speaking athletes were included to ensure comprehension of the instruments being administered. Any acute musculoskeletal injuries occurring to the bone, joint, or soft tissues were eligible for inclusion in this study. An acute musculoskeletal injury was defined as an injury occurring to the joint, bone, or soft tissue that takes place at a specific frame in time and with an identified mechanism of injury. Mild traumatic brain injuries or chronic injuries were not included in this study. However, re-injury that resulted in change in participation status or caused acute symptoms was included.

Participants were included in this study if their acute injury resulted in loss of playing/practice time or alterations in participation status in conditioning, practice or game. A certified athletic trainer or physician discerned a participant’s ability to withstand the demands of the sport during practice or competition in which subsequent participation restrictions were made.

Sports included in this study were categorized as collision, contact, and non-contact sports. The only collision sport included in this study was football. Contact sports included men’s and women’s basketball and women’s soccer. The non-contact sports included in this study were men’s and women’s golf, tennis, cheerleading, dance, track and field, volleyball and baseball.
Instrumentation

Demographic data collected for this study included age, gender, previous surgeries with a description of the type of surgery, and history of injury as well as current description of the injury and any loss of time from that injury. The athletic trainer responsible for making rehabilitation and participation decisions completed information describing the injured body part, injury type, injury severity, and participation status for the athlete on the day the athlete completed the questionnaires. All information was kept confidential, as each folder containing the athlete’s information had an identification number known only to the researcher and examining athletic trainer. A total of five instruments were administered on a one-time basis, and took approximately 10-15 minutes to complete.

Disablement in the Physically Active Scale (DPA)

The DPA was developed out of the necessity to have an accurate way to measure disablement in an active population. The DPA was created with a 4-factor structure including at impairments, functional limitations, disabilities, and health-related quality-of-life (HRQOL). The scale responses are based on an adjunct scale from 1 to 5 with 1 indicating patient does not have a problem and 5 indicates patient is severely affected by problem. The DPA is composed of 16 questions with each item and domain weighted equally and scores range from 0 to 64 with higher scores indicating greater levels of disablement. Several fit indices were used to measure the goodness of fit to the measurement model and revealed an acceptable 4 factor structure of the instrument (CMIN/DF=1.89, GFI= 0.852, TLI= 0.924, and CFI= 0.937). Validity was established
through an inverse relationship between individual DPA and patient reported global functioning scores in acutely injured patients ($r= -0.751$, $P>.001$). The DPA demonstrated internal consistency ($\alpha= 0.908$ to 0.890) and reliability with intraclass correlation value of 0.943. The area under the curve (AUC) value indicates the test’s ability to discriminate a meaningful change in participants. The AUC for the DPA ranged between 0.895(911 (95% confidence interval=.78, 1.00; $P>.001$) and 0.911 (95% confidence interval=.79, 1.00; $P>.001$). Finally the minimal clinically important difference value was found to be 6 points in chronic patients and 9 points in acute patients.$^3$

**Tampa Scale of Kinesiophobia (TSK)**

The TSK was originally designed by Kori et al.$^4$ as a 17-question form to measure fear of movement/re-injury in chronic pain patients.$^5$ Each item is scored on a 4-point Likert type scale with possibilities ranging from “strongly disagree” (score=1) to “strongly agree” (score=4)$^6$ with items 4, 8, 12, and 16 reversely scored.$^7$ Total points can range from 17-68$^6$ with higher scores reflecting greater fear of re-injury.$^5$ The original 17-question model introduced by Kori et al.$^4$ was subsequently found to have a four-factor structure labeled harm (3 items), fear of re-injury (2 items), importance of exercise (3 items), and avoidance of activity (4 items)$^8$. However, a different 2-factor structure of activity avoidance (8 items) and somatic focus (5 items) was found to hold similar psychometric properties across two tested pain syndromes: chronic lower back pain and fibromyalgia.$^6, 7$

The TSK has been evaluated by numerous studies$^5, 6, 7, 9$ all of which validate the TSK to be a reliable measure for kinesiophobia. However only Swinkels-Meewisse$^6$ used
the TSK to evaluate Kinesiophobia in acute injuries. The original 17-item questionnaire was found to have an internal consistency of $\alpha = .70$ to $.76$, but slightly better consistency $\alpha = .80$ to $.90$ was found when removing the inversely scored questions (4,8,12,16). The test re-test measures show slightly higher scores with removal of the inversely score items ($r = .79$), when compared to all items ($r = .78$). The validity of the TSK was established through a correlation between TSK scores and Fear Avoidance Belief Questionnaire (FABQ) scores. The FABQ is a well established and validated two-factor questionnaire looking at fear avoidance beliefs in work related activities and physical activity using a 7-point Likert scale. It is a resource used by clinicians to help to determine if a person is changing their lifestyle and behavior due to a fear of creating or worsening pain. These correlations revealed a validity of $r = .39$ to $.59$ with all items and $r = .38$ to $.59$ with the removal of inverse questions.

Visual Analog Scale for Pain (VAS)

When observing pain it is important to establish an objective measure of a patient’s pain level at the time of observation. The VAS was created to help establish an objective numerical rating to a person’s pain based on a visual reference. The scale used in this study is a 10cm horizontal line anchored by the terms “no pain” and “very severe pain” on opposite ends. The patient is asked how severe their pain is today, and are instructed to draw a line on the scale which best represents where their pain levels fall at the time. The score is determined by measuring the distance in millimeters from the “no pain” anchor to the patients mark providing a score from 0-100. A higher score indicates greater pain intensity. Based on results from post-surgical patients, the following pain
intensities have been recommended: no pain (0-4mm), mild pain (5-44 mm), moderate pain (45-75mm), and severe pain (75-100mm). The reliability of the VAS has been shown to be very high (r= 0.94, P< 0.001), but in the absence of a gold standard measure for pain criterion validity can’t be established. However, construct validity for patients with a variety of rheumatic diseases the VAS was highly correlated to the 5-point verbal descriptive scale and numeric rating scale (α= 0.71-0.78 and 0.62-0.91, respectively).  

Pain Catastrophizing Scale (PCS)

The role of catastrophizing in facilitating responses to pain has gained much attention in recent years. Subsequently the PCS was developed as way to measure potential risk for developing catastrophic thinking. Patients are asked to reflect on 13 questions based on past painful experiences and to indicate the degree of which they experience thoughts or feelings based on a 5 point scale from 0 (none at all) to 5 (all the time). Higher scores indicate greater levels of catastrophizing. Rumination accounted for 41% of variance, magnification accounted for 10% variance, and helplessness accounted for 8% variance. The α’s were .87, .60, and .79 for rumination, magnification, and helplessness respectively with an overall α of .87. In summary, the overall statistics indicate that the PCS is a reliable and valid measure of catastrophizing as scores were significant predictor of emotional distress.

Protocol

Potential participants were identified by an athletic trainer and recruited into the study by the primary investigator or the athletic trainer that identified the injury (Division
The participants completed a questionnaire packet once and no additional follow-up or outcome measures were assessed. Following the initial injury a minimum of 12 hours, but not exceeding 48 hours, was required to pass before a participant could complete a study packet. This timeframe was chosen so that the participant would have enough time to experience the painful stimuli from the injury but not before the end of the acute phase of injury. The participant was allowed to receive rehabilitation or treatment deemed necessary by their athletic trainer within the 48-hour period or prior being included in this study.

The potential participants were given a questionnaire packet (see appendix), which included an informative letter, demographic form, and all four instruments (DPA, TSK, PCS, VAS). The participants completed a demographic form, which gathered information about age, gender, previous surgeries, history of injury and a description of the current injury including any loss of time from that injury. The athletic trainer responsible for making rehabilitation and participation decisions completed information describing the injured body part, injury type, injury severity, and participation status for the participant. The participant implied consent by completing the study, which was approved by the Institutional Review Board of the host institution.

Data Analysis

Data analyses were performed using SPSS (version 20.0; SPSS Inc, Chicago, IL). A Pearson product moment correlation was used with the total DPA scale score and total TSK score to determine the relationship between kinesiophobia and disablement. A multiple regression analysis was used to understand the explanatory nature of pain, and
catastrophizing on kinesiophobia scores. The strength of the correlations were measured using Cohen’s criteria where a large effect is >.5, moderate effect is 0.5-0.3, a small effect is 0.3-0.1, and trivial effect is < 0.1.¹²
References


New Jersey: Lawrence Erlbaum.
CHAPTER 4
MANUSCRIPT

Abstract

Advances in injury management and rehabilitation have helped reduce the physical recovery time needed for many athletes to return to sport. However, psychological readiness to return to sport should also be addressed and if left untreated has the potential to negatively affect return to activity. Increases in kinesiophobia have often been observed in a chronic injury population with little understanding of its potential impact on an acute injury population. The purpose of this study was two-fold: 1.) to examine the relationship between kinesiophobia and disability in athletes with acute musculoskeletal injuries and 2.) to describe potential psychological factors that contribute to the development of kinesiophobia in athletes if a relationship is established.

Methods: Twenty-five NCAA collegiate athletes (10 females, 11 males; age = 20.1±1.5) who incurred an acute musculoskeletal injury resulting in a loss of playing/practice time or alterations in participation status in conditioning, practice or game participated in this study. Participants completed a study packet that included a demographic questionnaire and 4 psychometrically sound instruments: 1.) Visual Analog Scale (VAS), 2.) Pain Catastrophizing Scale (PCS), 3.) Tampa Scale of Kinesiophobia (TSK-17), and the Disablement in the Physically Active Scale (DPA).

Results: The TSK-17 scores explained 37.6% of the variance in DPA scores. (r=.613, R²=.376, p=.001). VAS scores were only moderately related to TSK-17 scores (r=.373, R²=.141, p=.020), but were highly related to DPA scores accounting for 52.2% of the DPA score variance (r=.723,
R²=.522, p<.001). VAS and PCS scores were not significantly able to explain variance in the TSK-17 scores (r=.467, R²=.226, F(2,22) = 3.214, p=.060). The combination of VAS, PCS, and TSK-17 explained 68.7% of variance in DPA scores (r=.829, R²=.687, F(3,21)=15.33, p<.001) Conclusion: The results suggest that kinesiophobia is present in an acute population, but cannot be entirely explained by the Fear Avoidance Model psychological constructs. However, The TSK-17 and VAS are useful tools to help practitioners understand an athlete’s disablement levels. Future research in this area is warranted to understand kinesiophobia in acute musculoskeletal injuries.

**Introduction**

Participation in sports and physical activity has always carried an inherent risk for injury. Multiple epidemiological studies have demonstrated increased risk for incurring both acute and chronic injuries across various age groups as a result of participation in sport.¹,²,³ Advances in the understanding and treatment of the physical aspect of injuries have helped improve an athlete’s physical readiness to return to sport but the psychological component is often underestimated. Two psychological components that have been identified to affect quality of life and recovery from injury are fear avoidance and pain perception.⁴ Many other psychological components factor into recovery after injury, but fear and pain perception are central factors to a full recovery.⁵ However, there has been little to no research to understand the relationship between fear, pain perception and disability in athletes during the acute phase of an injury.

Pain is a complex, multi-dimensional, physiological and psychological process that affects the body during injury.⁶ Acute pain serves a physiological purpose to prevent further injury or harm to our bodies in the short time following an injury. While the
reasons for developing chronic pain are not fully understood, pain-related fear and fear avoidance are suggested routes for understanding chronic pain.\textsuperscript{7} Linston et al.\textsuperscript{8} introduced the Fear Avoidance Model (FAM) (figure 1) using common psychological markers found in chronic pain patients as potential mechanisms for the development of chronic pain. The model is composed of three primary constructs: pain catastrophizing, pain-related anxiety, and pain-related fear; each of which has been identified as a predictor of disability in patients with musculoskeletal injury and chronic low back pain.\textsuperscript{9} Based on previous research\textsuperscript{9,10,11}, others have inferred that people possessing higher levels of one or all of these psychological constructs are more likely to develop fearful tendencies and chronic pain issues. Additionally, current evidence points to fear of movement/re-injury and pain self-efficacy as strong predictors of disablement outcomes in patients with chronic pain.\textsuperscript{5}

New research demonstrates that pain catastrophizing is associated with increased disability in a general population.\textsuperscript{12} The term catastrophizing was originally developed to describe a patient’s focus on the most extreme consequence conceivable\textsuperscript{13}, but has been adapted to describe a mechanism that a patient may use to respond to pain. In this situation, pain catastrophizing is defined as the manner in which an individual responds to an actual or impending painful experience.\textsuperscript{14} A person’s pain catastrophizing levels have been linked to pain perception revealing a potential link in predicting a person’s pain intensity.\textsuperscript{15}

Often times the term fear and anxiety are used interchangeably. Pain-related fear is fear of sensation of pain, fear of movement or re-injury, and fear of physical activity assumed to cause pain,\textsuperscript{14} and pain-related anxiety is a future oriented affective state in
which the source of the threat is elusive without a clear focus. While there is a distinct theoretical difference between the two, it is hard to differentiate between the constructs clinically, particularly when a perceived threatening stimuli exists. As a result the updated FAM theorizes that pain-related anxiety and pain-related fear are two distinct entities that are interrelated and can be a mechanism of fear avoidance. Therefore, pain-related anxiety is not a construct that is measured often in studies seeking to understand fear-avoidance. Pain-related fear, on the other hand, has been investigated and is indicated as a predictor of disability in a chronic population even more so than biomechanical status and pain intensity. In order to better specify patients that exhibited a fear of movement or injury, Kori, Miller, and Todd coined the term kinesiophobia, “a condition in which a patient has an excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury”, as a way to better classify these specific constructs as a causal link to pain. The term kinesiophobia is commonly used in the literature to convey pain-related fear and has been investigated primarily observing injuries to the low back, post-operative ACL, and post-operative shoulder patients.

Following an acute musculoskeletal injury, psychological changes happen immediately and are heightened due to the trauma and stress placed on the athlete’s life. To date, there is evidence to suggest a relationship between catastrophizing and kinesiophobia, as potential mechanisms for explaining variance in disability in patients with similar limitations. However, it is worth noting that a majority of research performed to understand kinesiophobia has been conducted on a general population with
chronic injuries. There have been several studies involving acute low back pain,\textsuperscript{5, 28} but very limited research exists to explain the affect of kinesiophobia on any other injury types. An important take away from both chronic and acute kinesiophobia studies is that pain-related behaviors can be adaptive in the acute stage of injuries, and potentially worsen in the case of long lasting pain exacerbating disability and pain threshold.\textsuperscript{29} As a result, it is important for not only the patient to be aware of psychological markers that may impede recover from an injury, but recognition can assist the clinician in designing a rehabilitation program that addresses these concerns early.

Given the potential impact that FAM, particularly pain catastrophizing and kinesiophobia, may play in understanding disablement in athletes, it is important to begin investigating this phenomenon in athletes with acute injuries. Therefore, the purpose of this study was two-fold: 1.) to examine the relationship between kinesiophobia and disability in athletes with acute musculoskeletal injuries and 2.) to describe potential psychological factors that contribute to the development of kinesiophobia in athletes.

**Methods**

**Participants**

A total of 25 NCAA Division I and III collegiate athletes (10 females, 11 males; age = 20.1±1.5) participated in the study. Due to the nature of this study, only English speaking athletes were included to ensure comprehension of the instruments being administered. Any participant who suffered from an acute musculoskeletal injury was eligible for inclusion in this study. An acute musculoskeletal injury was defined as an injury occurring to the joint, bone, or soft tissue that took place at a specific time frame with an identified mechanism of injury.\textsuperscript{30} Mild traumatic brain injuries or chronic injuries
were not included in this study. However, re-injury that resulted in change in participation status or caused acute symptoms was included.

Participants were included in this study if their acute injury resulted in any loss of playing/practice time or alterations in participation status in conditioning, practice or game. The majority of participants (14 of 25 [56%]) sustained a new injury, while the remaining athletes (11 of 25 [44%]) reported re-injury. The severity of each injury varied but the majority fell into the moderate category (10) followed by mild (8) then severe (7). Table 1 describes the injuries by type and location. Injury classification was based on previous research by Dick et al.,\textsuperscript{30} which used time loss from activity as an indicator of injury severity. A mild injury was classified as being held from activity for 1 day, moderate injury was being held from activity between 2-10 days, and severe injury was missing more than 10 days of activity.

The sports included in this study were categorized as collision (football), contact (men’s and women’s basketball and women’s soccer), and non-contact sports (men’s and women’s golf, tennis, cheerleading, dance, track and field, volleyball and baseball). The participants were athletes participating in football (n=12) followed by track (n=4), women’s basketball (n=2), softball (n=2), soccer (n=2), cheerleaders & dance team (n=2), and baseball (n=1).

**Instrumentation**

To understand the relationship between patient-reported disablement levels and kinesiophobia the Disablement in the Physically Active scale (DPA) and the Tampa Scale of Kinesiophobia (TSK) were used. Furthermore, to understand the explanatory value of
the Fear Avoidance Model in understanding kinesiophobia scores, the Visual Analog Scale (VAS) and Pain Catastrophizing Scale (PCS) were also administered.

The Disablement in the Physically Active Scale (DPA) was developed out of the necessity to have an accurate way to measure disablement in an active population. The DPA was created with a 4-factor structure including at impairments, functional limitations, disabilities, and health-related quality-of-life (HRQOL). The scale responses are based on an adjunct scale from 1 to 5 with 1 indicating patient does not have a problem and 5 indicates patient is severely affected by problem. The DPA is composed of 16 questions with each item and domain weighted equally and scores range from 0 to 64 with higher scores indicating greater levels of disablement. Several fit indices were used to measure the goodness of fit to the measurement model and revealed an acceptable 4 factor structure of the instrument (CMIN/DF=1.89, GFI= 0.852, TLI= 0.924, and CFI= 0.937). Validity was established through an inverse relationship between individual DPA and patient reported global functioning scores in acutely injured patients (r= -0.751, P>.001). The DPA demonstrated internal consistency (α= 0.908 to 0.890) and reliability with intraclass correlation value of 0.943. The area under the curve (AUC) value indicates the test’s ability to discriminate a meaningful change in participants. The AUC for the DPA ranged between 0.895 (911 (95% confidence interval= 0.78, 1.00; P>.001) and 0.911 (95% confidence interval= 0.79, 1.00; P>.001). Finally the minimal clinically important difference value was found to be 6 points in chronic patients and 9 points in acute patients.

The Tampa Scale of Kinesiophobia (TSK) was originally designed by Kori et al. as a 17-question form to measure fear of movement/re-injury in chronic pain patients.
Each item is scored on a 4-point Likert type scale with possibilities ranging from “strongly disagree” (score=1) to “strongly agree” (score=4)\textsuperscript{34} with items 4,8,12, and 16 reversely scored.\textsuperscript{16} Total points can range from 17-68\textsuperscript{34} with higher scores reflecting greater fear of re-injury.\textsuperscript{33} The original 17-question model introduced by Kori et al.\textsuperscript{19} was subsequently found to have a four-factor structure labeled harm (3 items), fear of re-injury (2 items), importance of exercise (3 items), and avoidance of activity (4 items).\textsuperscript{7} However, a different 2-factor structure of activity avoidance (8 items) and somatic focus (5 items) was found to hold similar psychometric properties across two tested pain syndromes: chronic lower back pain and fibromyalgia.\textsuperscript{16,34}

The TSK has been evaluated by numerous studies\textsuperscript{16,33,34,35} all of which validate the TSK to be a reliable measure for kinesiophobia. However only Swinkels-Meewisse\textsuperscript{6} used the TSK to evaluate kinesiophobia in acute injuries. The original 17-item questionnaire was found to have an internal consistency of $\alpha=0.70$ to 0.76,\textsuperscript{6} but slightly better consistency $\alpha=0.80$ to 0.90\textsuperscript{34} was found when removing the inversely scored questions (4,8,12,16). The test re-test measures show slightly higher scores with removal of the inversely score items ($r=0.79$), when compared to all items ($r=0.78$).\textsuperscript{34} The validity of the TSK was established through a correlation between TSK scores and Fear Avoidance Belief Questionnaire (FABQ) scores. The FABQ is a well established and validated\textsuperscript{36} two-factor questionnaire looking at fear avoidance beliefs in work related activities and physical activity using a 7-point Likert scale.\textsuperscript{34} It is a resource used by clinicians to help to determine if a person is changing their lifestyle and behavior due to a fear of creating or worsening pain. These correlations revealed a validity of $r=0.39$ to 0.59 with all items and $r=0.38$ to 0.59 with the removal of inverse questions.
The Visual Analog Scale for Pain (VAS) is important because it establishes an objective measure of a patient’s pain level at the time of observation. The VAS was created to help establish an objective numerical rating to a person’s pain based on a visual reference. The scale used in this study is a 10cm horizontal line anchored by the terms “no pain” and “very severe pain” on opposite ends. The patient is asked how severe their pain is today, and are instructed to draw a line on the scale which best represents where their pain levels fall at the time. The score is determined by measuring the distance in millimeters from the “no pain” anchor to the patients mark providing a score from 0-100. A higher score indicates greater pain intensity. Based on results from post-surgical patients, the following pain intensities have been recommended: no pain (0-4mm), mild pain (5-44 mm), moderate pain (45-75mm), and severe pain (75-100mm). The reliability of the VAS has been shown to be very high (r= 0.94, P< 0.001), but in the absence of a gold standard measure for pain criterion validity can’t be established. However, construct validity for patients with a variety of rheumatic diseases the VAS was highly correlated to the 5-point verbal descriptive scale and numeric rating scale (α= 0.71-0.78 and 0.62-0.91, respectively).

The role of catastrophizing in facilitating responses to pain has gained much attention in recent years. Subsequently the Pain Catastrophizing Scale (PCS) was developed as way to measure potential risk for developing catastrophic thinking. Patients are asked to reflect on 13 questions based on past painful experiences and to indicate the degree of which they experience thoughts or feelings based on a 5 point scale from 0 (none at all) to 5 (all the time). Higher scores indicate greater levels of catastrophizing. Rumination accounted for 41% of variance, magnification accounted for 10% variance,
and helplessness accounted for 8% variance. The α’s were 0.87, 0.60, and 0.79 for rumination, magnification, and helplessness respectively with an overall α of 0.87. In summary, the overall statistics indicate that the PCS is a reliable and valid measure of catastrophizing as scores were significant predictor of emotional distress.

**Protocol**

Potential participants were identified by an athletic trainer and recruited into the study by the primary investigator or the athletic trainer that identified the injury (site dependant). The participants completed a questionnaire packet once and no additional follow-up or outcome measures were assessed. Following the initial injury a minimum of 12 hours, but not exceeding 48 hours, was required to pass before a participant could complete a study packet. This timeframe was chosen so that the participant would have enough time to experience the painful stimuli from the injury but not before the acute phase of injury was completed. The participant was allowed to receive rehabilitation or treatment deemed necessary by their athletic trainer within the 48-hour period or prior being included in this study.

The potential participants were given a questionnaire packet (see appendix), which included an informative letter, demographic form, and all four instruments (DPA, TSK, PCS, VAS) at least 12 hours after injury but before the 48-hour time limit. The participants completed a demographic form, which gathered information about age, gender, previous surgeries, history of injury and a description of the current injury including any loss of time from that injury. The athletic trainer responsible for making rehabilitation and participation decisions completed information describing the injured body part, injury type, injury severity, and participation status for the participant. The
participant implied consent by completing the study, which was approved by the Institutional Review Board of the host institution.

**Statistical Analysis**

Data analyses were performed using SPSS (version 20.0; SPSS Inc, Chicago, IL). A Pearson product moment correlation was used with the total DPA scale score and total TSK score to determine the relationship between kinesiophobia and disablement. A multiple regression analysis was used to understand the explanatory nature of pain, and catastrophizing on kinesiophobia scores. The strength of the correlations were measured using Cohen’s criteria where a large effect is >.5, moderate effect is 0.5-0.3, a small effect is 0.3-0.1, and trivial effect is < 0.1.39

**Results**

The relationship between TSK-17 and DPA scores was statistically significant and large with TSK-17 scores explaining 37.6% of the variance in DPA scores, \( r = .613, R^2 = .376, p = .001 \). VAS scores were only moderately related to TSK-17 scores, \( r = .373, R^2 = .141, p = .020 \), but were highly related to DPA scores accounting for 52.2% of the DPA score variance, \( r = .723, R^2 = .522, p < .001 \). The PCS scores were moderately related to TSK-17 scores, \( r = .404, R^2 = .163, p = .045 \) and DPA, \( r = .503, R^2 = .253, p = .010 \).

The combination of the VAS and PCS scores were not significantly able to predict variance in the TSK-17 scores, \( r = .467, R^2 = .226, F_{(2,22)} = 3.214, p = .060 \). The VAS, PCS, and TSK-17 explained 68.7% of variance in DPA scores, \( r = .829, R^2 = .687, F_{(3,21)} = 15.33, \ p < .001 \). The VAS, \( \beta = .534; t(21) = 3.949, \ p = .001 \) and TSK-17, \( \beta = .340; t(21) = 2.449, \ p = .023 \) significantly contributed to the model, whereas PCS scores, \( \beta = .183; t(21) = 1.33, \ p = .183 \) did not.
Discussion

The purpose of this study was to establish the relationship between kinesiophobia and disability in an athletic population. In addition, this investigation sought to describe the relationship between pain and catastrophizing and their contribution to this relationship of kinesiophobia. The correlation analysis performed on the sample of athletes with acute musculoskeletal injuries revealed large, significant relationships between pain and disablement as well as between kinesiophobia and disablement. Moderate, significant relationships were identified between pain catastrophizing and kinesiophobia as well as pain and kinesiophobia. The combination of the pain and pain catastrophizing scores were unable to significantly describe changes in kinesiophobia. However, the combination of pain, pain catastrophizing and kinesiophobia explained 68.7% of the variance in disablement scores with both pain and kinesiophobia contributing significantly to the model.

Our initial findings show a large relationship between pain and disability, which has been supported through many studies. A similar study by Handrakis et al. observed college age students (mean age 24.4 years) with chronic low back pain found a strong correlation to pain intensity and disability levels. This has been supported by prior evidence that higher levels of pain have been associated with decreased levels of function. Furthermore, pain is a universal response following an injury that is often cited as a common injury impairment and concern for patients when returning to activity. Impairments associated with pain in an acute injury include swelling, loss of range of motion, decreased muscle strength, and instability. Our research supports the notion that pain can be a precursor to disability, based on the high relationship amongst
These factors along with age, previous history, and coping mechanisms all have the potential to be mediators in affecting a person’s pain intensity response.

In this investigation, kinesiophobia also had a significant correlation (r=.613, $R^2=.376$, p=.001) to disability and was able to account for 37.6% of variance in disability scores. In studies with patients with chronic low back pain, kinesiophobia was shown to be a predictor of patient disability. A study by Chemewski et al. was able to successfully show a relationship between TSK-11 scores and function within ACL patients one year after surgery. Fear of movement and re-injury was not a significant contributor to a regression model in the 6 months following surgery, but was able to explain an additional 12.7% variance on the International Knee Documentation Committee subjective form score, even after demographic variables and pain intensity were already considered. This along with our study suggests that kinesiophobia does have a relationship with perceived disability, along with other psychological mediators.

This begs the question of what causes some athletes to develop fearful tendencies along with perceived disability while others do not. There is evidence to support the idea that kinesiophobia is not an innate human reaction, but instead other psychological factors must be at work. Another study has supported a link between the acquisition of fear through an associative learning process. This suggests that during an injury, a person could have learned to associate the perception of pain through a task or movement, when in fact no biological or nociceptive pathways are stimulated.

Additionally, the greatest mood disturbances associated with pain, such as anxiety, anger, fear, and confusion, occur initially following injury, and it is possible previous learned experience could dictate psychological response to an injury. Identifying patients that
present initially with higher levels of kinesiophobia and addressing psychological concerns early on in rehabilitation could limit potential long-term complications regarding fear of activity and perceived disability. Tailoring a rehabilitation plan to include psychological interventions to supplement the physical components of rehab will allow the athlete to be both physically and psychologically ready to return to activity.

Contrary to previous research, we found no significant relationship between pain catastrophizing and pain \((r = .341, p = .095)\), but pain catastrophizing did have a moderate, significant relationship with perceived disability \((r = .503, p = .010)\) and kinesiophobia \((r = .404, p = .045)\). Additionally, catastrophizing did not significantly contribute to explaining variance in either the TSK-17 or the DPA scores. There are a number of explanations for the results noted in this study. One potential explanation is that the patient population observed in this study were young collegiate athletes (mean age = 20.1), and all except one had a history of at least one previous injury. Injury is common in sport with injury rates ranging from 13.8 per 1,000 in games to 4.0 per 1,000 in practice in collegiate populations.\(^45\) Perhaps a history of dealing with multiple injuries could have helped decrease pain catastrophizing. Age may also play a role in reducing the tendency for catastrophizing. A study by Tripp et al.\(^46\) observed catastrophizing in adults (20-53 years) compared to adolescents (16-18 years) following ACL surgery. It reported that 24-hours post-operation adolescents reported higher pain, anxiety, and catastrophizing scores than adults. Pain catastrophizing is a specific mindset that will impact a person’s behavior, functional ability and quality of life.\(^47\) A variety of associated mediators including, age, gender, previous injury, and fear of movement, have all been shown to contribute a person developing catastrophic thinking.\(^47\) Future studies should
include larger samples to be able to analyze data by injury history, severity, age, and gender since all have been shown to contribute to catastrophizing.

Like many previous studies, our study demonstrates that kinesiophobia had a moderate, non-significant relationship \((r=.373, p=.066)\) to patient reported pain. A study by Crombez et al. demonstrated that TSK scores in chronic low back pain patients were not significantly related to pain intensity. Additionally, an earlier study from Crombez et al. revealed that despite having low back pain and high fear avoidance doesn’t result in higher anticipated pain scores during activity than those with back pain and low fear avoidance scores. Even in a study of over 610 patients who suffered an acute low back injury, pain intensity and kinesiophobia had a small, albeit significant correlation \((r=.18, p<.010)\). These results are not unexpected since according to the FAM, the route to developing fearful tendencies is not solely influenced by pain levels. Rather, kinesiophobia is mediated by several psychological constructs including catastrophizing and anxiety. The FAM also suggests that those patients that confront their fears can avoid the negative cycle that ensues from activity avoidance, compared to someone who maintains fearful tendencies and in extreme cases can develop phobias. The route to developing kinesiophobia is unique to the individual based on a culmination of many psychological components, which cannot be entirely explained through one entity but rather by the sum of its parts. Our results reveal the presence of several key psychological mediators to chronic pain, kinesiophobia and disability, do exist in the early stages of an injury.

This study was the first of its kind to observe injuries within a 12-48 hour window when the patient is still in the acute stage of healing. The majority of studies have
observed these psychological constructs in a population with chronic injuries with some examining as long as 6 months post injury. In chronic injuries the element of time where a person has been dealing with symptoms of an injury may contribute to the development of persistent and negative thoughts about an injury and affect their outlook on recovery. A general negative mood state has been shown to be related to current pain and functional disability. Understanding that confidence and mood can effect psychological measures, several studies have shown a link between self-efficacy and disability. Self-efficacy is defined as one’s confidence in performing a particular behavior and overcoming barriers to that behavior. Pain-related self-efficacy is one’s ability to manage pain and has been demonstrated to affect pain levels in an acute, chronic, and experiment induced pain population. A person’s self-efficacy beliefs are directed towards a specific behavior and how people hold their abilities to cope in the face of adversity. Several articles have suggested that functional self-efficacy is most strongly associated with disability outcomes. However, a majority of the pain research available provides little evidence of a constant pattern in understanding the effect of catastrophizing, fear of movement and re-injury, and pain self-efficacy individually or their interactions together. In addition, the role of pain self-efficacy in acute injuries has not been investigated. Future research should follow patients with acute injuries and observe changes in self-efficacy from initial injury to return to activity since pain related self-efficacy would change over time.

The results of this study lay the groundwork for future investigations to observe psychological constructs throughout the course of an injury. These findings suggest that several key psychological components exist during the acute phase of an injury, but also
show the route for developing kinesiophobia and disability is a multifactorial process not totally explained by the FAM. Despite having a small sample size, the combination of kinesiophobia, pain, and catastrophizing were able to explain 68.7% of variance in patient-reported disability. This shows that patient’s perceived disability is influenced by psychological constructs, however more research needs to be performed on the long-term interrelationship between catastrophizing, pain intensity, kinesiophobia, pain self-efficacy and disability. Additionally, understanding the role of injury severity and previous injury history may influence how person responds psychologically.

Limitations

The sample size in this study was low and a longer data collection period or including additional data collection sites would have been necessary to obtain an ideal sample size. A number of acutely injured athletes were missed within the 48-hour window, which ultimately reduced the sample size and generalizability of some of the findings. In addition, the majority of participants were male and played football. This does provide a full picture of response to injury as it has been shown that females can respond differently than males as previous research suggests that females have lower self-efficacy \(^5\) scores and higher catastrophizing scores than males. \(^4\) Future studies should have a balanced population with the ability to analyze the relationship between kinesiophobia and disability in both the male and female population separately. Additionally, the majority of the participants participated in football, a collision sport, which may limit the generalizability of the findings to athletes that participate in sports that have limited contact or no contact.

Another limitation of the study was that we were unable to complete a statistical
analysis based on different levels of injury severity and history of injury. While this study does have a relatively even distribution of mild, moderate, and severe injury we are unable to determine if one type of injury causes higher levels of kinesiophobia or disability.

**Conclusions**

In conclusion, there is significant relationship between kinesiophobia and disability in acutely injured athletes. Additionally, disability had the highest correlation with pain. In this study, kinesiophobia accounted for 36.8% of variance in disability alone, and in combination with pain and catastrophizing 68.7% of variance in disability was able to be explained. Interestingly, catastrophizing was not significant in accounting for any variance in kinesiophobia or disability scores. Future research needs to be done on a larger population observing measures from the initial injury until the athlete is cleared to return to full activity. Additionally, age, gender, and previous injury history could have an affect on the magnitude of some psychological constructs. The TSK-17 and DPA are useful tools to accurately assess measures in an acute situation of kinesiophobia and disability among an athletic population.
References:


5. Asenlof P, Soderlund A. A further investigation of the importance of pain cognition and behavior in pain rehabilitation: Longitudinal data suggests disability and fear of movement are most important. *Clinical Rehabilitation.* 2010; 24: 422-430.


Index:

Figure 2: Fear Avoidance Model

Table 1. Injury Rates by Type

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Number of injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle Sprain</td>
<td>6</td>
</tr>
<tr>
<td>Hamstring Strain</td>
<td>4</td>
</tr>
<tr>
<td>Knee Sprain</td>
<td>4</td>
</tr>
<tr>
<td>Shoulder Strain</td>
<td>3</td>
</tr>
<tr>
<td>Wrist Sprain</td>
<td>2</td>
</tr>
<tr>
<td>Lumbar Strain</td>
<td>2</td>
</tr>
<tr>
<td>Thumb Sprain</td>
<td>2</td>
</tr>
<tr>
<td>Triceps Strain</td>
<td>1</td>
</tr>
<tr>
<td>Gluteus Medius Strain</td>
<td>1</td>
</tr>
</tbody>
</table>
Dear Participant,

Thank you very much for volunteering to participate in this study to observe several psychological factors that may be present during the onset of an injury. It is important that you are aware that at anytime you may withdraw from this study or refuse to answer any question that you feel is inappropriate or do not wish to give a response for.

Please fill out each survey to the best of your ability and answer each question honestly. The information provided from each survey will be kept confidential and will only be viewed by the primary investigator for data analysis.

Thank you again for your help by completing each survey to the best of your ability!

Sincerely,

Bennett Rack
Demographic Questionnaire:

Please print legibly

Age: ___________________  Gender:  Male  or  Female

Current Sport: ________________________________

Have you previously been injured?  Yes  or  No

If YES,
What was/were your previous injury diagnosis (list all you can recall)?
Please include approximate date of injury
__________________________________________________________
__________________________________________________________

Estimate how long you were out of practice or competition for each injury.
__________________________________________________________
__________________________________________________________

Have you ever injured this same body part?  Yes  or  No

Have you ever had surgery?  Yes  or  No

If YES,
What type(s) of surgery did you have? Please include approximate date of surgery.
__________________________________________________________
__________________________________________________________
__________________________________________________________

To be completed by ATC:
Injured Body Part: ________________________________

Injury Diagnosis: ________________________________

Severity: ____________________________ (mild, moderate, severe)
Mild: injury that results in restriction of performance for 1 or more calendar days
Moderate: injury that results in restriction of performance between 1 & 10 days
Severe: injury that results in restriction of performance more than 10 days
Time lost from activity: ____________________________
### Tampa Scale for Kinesiophobia

Instructions: Please answer the following questions according to your true feelings not according to what others think you should believe. Score each statement from strongly disagree to strongly agree by circling the appropriate box.

1 = strongly disagree  
2 = disagree  
3 = agree  
4 = strongly agree

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I’m afraid that I might injury myself if I exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. If I were to try to overcome it, my pain would increase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. My body is telling me I have something dangerously wrong</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. My pain would probably be relieved if I were to exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. People aren’t taking my medical condition seriously enough</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. My accident has put my body at risk for the rest of my life</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Pain always means I have injured my body</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Just because something aggravates my pain does not mean it is dangerous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I am afraid that I might injure myself accidentally</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I wouldn’t have this much pain if there weren’t something potentially dangerous going on in my body</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Although my condition is painful, I would be better off if I were physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Pain lets me know when to stop exercising so that I don’t injure myself</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. It’s really not safe for a person with a condition like mine to be physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. I can’t do all the things normal people do because it’s too easy for me to get injured</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Even though something is causing me a lot of pain, I don’t think it’s actually dangerous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. No one should have to exercise when he/she is in pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Disability in the Physically Active Scale©

Instructions: Please answer each statement with one response by shading the circle that most closely describes your problem(s) within the past 24 hours. Each problem has possible descriptors under each. Not all descriptors may apply to you but are given as common examples.

**KEY**

1 - no problem
2 - I have the problem(s), but it does not affect me
3 - The problem(s) slightly affects me
4 - The problem(s) moderately affects me
5 - The problem(s) severely affects me

<table>
<thead>
<tr>
<th></th>
<th>No problem</th>
<th>Does not affect</th>
<th>Slight</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pain</strong> - “Do I have pain?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Motion</strong> - “Do I have impaired motion?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ex. decreased range/ease of motion, flexibility, and/or increased stiffness</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Muscular Functioning</strong> - “Do I have impaired muscle function?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ex. decreased strength, power, endurance, and/or increased fatigue</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Stability</strong> - “Do I have impaired stability?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ex. the injured area feels loose, gives out, or gives way</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Changing Directions</strong> - “Do I have difficulty with changing directions in activity?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ex. twisting, turning, starting/stopping, cutting, pivoting</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Daily Actions</strong> - “Do I have difficulty with daily actions that I would normally do?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ex. walking, squatting, getting up, lifting, carrying, bending over, reaching, and going up/down stairs</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Maintaining Positions</strong> - “Do I have difficulty maintaining the same position for a long period of time?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ex. standing, sitting, keeping the arm overhead, or sleeping</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Skill Performance</strong> - “Do I have difficulties with performing skills that are required for physical activity?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>1.) Ex. running, jumping, kicking, throwing, &amp; catching</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2.) Ex. coordination, agility, precision &amp; balance</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Overall Fitness</strong> - “Do I have difficulty maintaining my fitness level?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ex. conditioning, weight lifting &amp; cardiovascular endurance</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Participation in Activities</strong> - “Do I have difficulty with participating in activities?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>1.) Ex. participating in leisure activities, hobbies, and games</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2.) Ex. participating in my sport(s) of preference</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Well Being</strong> - “Do I have difficulties with the following...?”</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>1.) Increased uncertainty, stress, pressure, and/or anxiety</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2.) Altered relationships with team, friends, and/or colleagues</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>3.) Decreased overall energy</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4.) Changes in my mood and/or increased frustration</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

0 – not at all  1 – to a slight degree  2 – to a moderate degree  3 – to a great degree  4 – all the time

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I worry all the time about whether the pain will end.</td>
</tr>
<tr>
<td>2</td>
<td>I feel I can’t go on.</td>
</tr>
<tr>
<td>3</td>
<td>It’s terrible and I think it’s never going to get any better.</td>
</tr>
<tr>
<td>4</td>
<td>It’s awful and I feel that it overwhelms me.</td>
</tr>
<tr>
<td>5</td>
<td>I feel I can’t stand it anymore.</td>
</tr>
<tr>
<td>6</td>
<td>I become afraid that the pain will get worse.</td>
</tr>
<tr>
<td>7</td>
<td>I keep thinking of other painful events.</td>
</tr>
<tr>
<td>8</td>
<td>I anxiously want the pain to go away.</td>
</tr>
<tr>
<td>9</td>
<td>I can’t seem to keep it out of my mind.</td>
</tr>
<tr>
<td>10</td>
<td>I keep thinking about how much it hurts.</td>
</tr>
<tr>
<td>11</td>
<td>I keep thinking about how badly I want the pain to stop.</td>
</tr>
<tr>
<td>12</td>
<td>There’s nothing I can do to reduce the intensity of the pain.</td>
</tr>
<tr>
<td>13</td>
<td>I wonder whether something serious may happen.</td>
</tr>
</tbody>
</table>
How severe is your pain today?
Place a vertical mark on the line below to indicate how bad you feel your pain is today.

No pain [ ] Very severe pain
LITERATURE CITED

1. Glazer, DD. Development and preliminary validation of the injury-psychological

2. Podlog L, Dimmock J, Miller J. A review of return to sport concerns following
injury rehabilitation: Practitioner strategies for enhancing recovery outcomes.

3. Hamson-Utly JJ, Martin S, Walters J. Athletic trainers’ and team therapists’
perception of the effectiveness of psychological skills within sports injury and

4. Snyder AR, Parsons JT, Valovich-McLeod TC, Bay R, Michener LA, Sauers EL.
Using disablement models and clinical outcomes assessment to enable evidence-
based athletic training practice, part I: disablement models. *J Athl Train.* 2008;

5. Vela LI, Dengar C. Transient disablement in the physically active with
musculoskeletal injuries, part 1: A descriptive model. *J Ath Train.* 2010; 45(6);
615-629.


