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REVIEW

Sport-related anxiety: current insights

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Abstract: To date, much research has been devoted to understanding how anxiety can affect sport performance, both in practice and in competitive settings. It is well known that sport has the potential for high levels of stress and anxiety, and that practicing and employing a range of psychological strategies can be beneficial in anxiety management. Equally, growing evidence also suggests that anxiety can play a role in sport injury prevention, occurrence, rehabilitation, and the return to sport process. The purpose of this paper is to provide current insights into sport-related anxiety. More specifically, it will provide the reader with definitions and theoretical conceptualizations of sport-related anxiety. This will be followed by making a case for considering the term "performance" to be broader than activities associated with sport-related performance in practice and competition, by including performance activities associated with sport injury prevention, rehabilitation, and the return to sport process. The paper will then highlight the importance of recognizing early signs and symptoms of anxiety, and the potential need for referral. Finally, the conclusions will emphasize the need for appropriate, client-specific, and practitioner competent care for athletes experiencing sport-related anxiety.

Keywords: anxiety, sport, performance, injury, sport medicine professional, sport psychology, mental health

Video abstract

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Introduction

I don't think you're human if you don't get nervous. Sidney Crosby.

Sidney Crosby, a two-time Olympic gold medalist, a World and a Junior World champion, a two-time National Hockey League Most Valuable Player, a three-time Stanley Cup Champion, and a six-time National Hockey League all-star, is certainly not the only athlete who reports experiencing nerves when performing in his sport. Nor is he the only athlete who has developed routines to combat such nerves. This is unsurprising, as sport psychology researchers have somewhat unanimously agreed that competitive sport has the potential for high levels of stress and anxiety.[1] Equally, practicing and employing a range of psychological strategies to combat potential negative emotional states such as sport-related anxiety has become an integral part of a competitive athlete's performance preparation.[1,2] The purpose of this article is to present the reader with current insights into sport-related anxiety. First, the article will define and theoretically conceptualize sport-related anxiety. Second, the article will introduce the reader to a broader concept of sport performance. In particular, the article will make a case for considering the term "performance" to be broader than activities associated with sport-related performance in practice and competition, by including performance activities associated with sport injury prevention, rehabilitation, and the return to sport process. Considering the primary audience of the article,

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the focus will then shift to the role of anxiety during different phases of sport injury: occurrence, rehabilitation, and return to sport. This will be followed by a short conclusion of the key points of the article, emphasizing the role of sport medicine professionals in providing appropriate, client-specific, and practitioner competent care for athletes experiencing sport-related anxiety.

Defining anxiety

Typically defined as "an unpleasant psychological state in reaction to perceived stress concerning the performance of a task under pressure",[3] anxiety is a common emotional state experienced by athletes at all levels of performance. In general, anxiety is made up of cognitive (e.g., worrying thoughts and apprehensions) and somatic (e.g., degree of physical activation) components. Anxiety can manifest itself as a stable part of one's personality known as trait anxiety, or as a temporary, more malleable, situation-specific state anxiety.[2] In a sport context, anxiety is often regarded as a typical response to a situation where an athlete's skills are being evaluated.[4] Anxiety is often characterized by a range of physiological (e.g., sweating, increased heart rate), behavioral (e.g., biting fingernails, fidgeting), and/or cognitive (e.g., negative thoughts, inattention) signs and symptoms (for more details on anxiety, please see Weinberg and Gould[2]). A recent review revealed that the terms competitive state anxiety, competitive trait anxiety, somatic anxiety, cognitive anxiety, behavioral anxiety, performance anxiety, facilitative anxiety, debilitative anxiety, competition anxiety, and pre- and postcompetition anxiety have also been used to describe sport-related anxiety. For more details, please see recent review by Patel et al.[5] Based on the definitions above, the current paper will adopt a definition of sport-related anxiety as being a trait and/or state-like response to a stressful sport-related situation, which the individual perceives as potentially stressful, resulting in a range of cognitive appraisals, behavioral responses, and/or physiological arousals.

Theoretical conceptualizations

How anxiety impacts performance has received much attention in the sport psychology literature. Some of the early theories include the inverted-U hypothesis,[6] drive theory,[7] and reversal theory.[8] The inverted-U hypothesis suggests that performance and anxiety should be viewed on an inverted U-shaped continuum. According to Yerkes and Dodson,[6] low arousal/anxiety leads to decreases in performance, and increases in arousal/anxiety can facilitate performance up to an optimal level. The model also assumes that beyond this point, additional arousal/anxiety causes performance to decline. In contrast, the drive theory proposes the relationship between performance and state anxiety as linear, with higher anxiety leading to better performance.[7] The model proposes that high levels of arousal/state anxiety will increase an individual's dominant responses to the task, and thus resulting in stronger quality performances. Finally, the reversal theory[8] puts forth an additional dimension to the anxiety–performance relationship by suggesting that the ways in which arousal/anxiety affects performance depend on the individual's own interpretation of their arousal/anxiety levels as either debilitative or facilitative.

These early theories have provided a useful foundation for more multidimensional models to emerge. One of the first comprehensive multidimensional models that emerged is the conceptual model of athletic performance anxiety by Smith and Smoll.[4] The Smith and Smoll conceptual model proposed that when faced with a competitive sporting situation, an individual will make cognitive appraisals of the perceived imbalance of the situational demands, resources, consequences, and the "meaning" of consequences. These cognitive appraisals have a reciprocal relationship with physiological arousal, and the aforementioned stress response process is also influenced by the individual's cognitive and somatic sport-specific trait anxiety and existing defensive operations such as range of coping strategies.[4] Depending on the stress response, task-relevant or task-irrelevant cognitive, behavioral, and physiological responses will ensue, which will influence subsequent sport performance.[4] The model also proposes that the sport performance itself will also influence any subsequent competitive sport situations, and any subsequent cognitive appraisals and physiological arousals of such situations (for more details of the model, please see Smith and Smoll[4]).

Since the development of the Smith and Smoll model,[4] many other theoretical models (Table 1) have also been developed with the aim to explain sport-related anxiety and its relationship with performance. These include the multidimensional anxiety theory,[9] catastrophe theory,[10] and the Individual Zones of Optimal Functioning.[11] The multidimensional anxiety theory[9] draws from the earlier models by proposing that cognitive state anxiety is negatively related to performance, whereas somatic state anxiety is related to performance in an inverted-U manner. Similarly, the catastrophe theory[10] builds on earlier work by supporting the inverted-U hypothesis, but only when the individual has low cognitive state anxiety. Finally, the Individual Zones of Optimal Functioning model[11] suggests that for an optimal

Table 1 Brief descriptions of various models developed to explain sport-related anxiety and its relationship with performance

Inverted-U Hypothesis (Yerkes and Dodson[6])	This view holds that low arousal/anxiety leads to decreases in performance, and increases in arousal/anxiety can facilitate performance up to an optimal level, however, beyond this point additional arousal/anxiety causes performance to decline.
Drive Theory (Hull[7])	This view holds that relationship between situation specific state anxiety and performance is linear; higher anxiety leads to better performance.
Reversal Theory (Apter[8])	This view holds that the ways in which arousal/anxiety affects performance depend on the individual's own interpretation of their arousal/anxiety levels.
The Conceptual Model of Athletic Performance Anxiety (Smith and Smoll[4])	This view holds that arousal/anxiety can influence individuals' stress response to a competitive situation, which in turn will influence performance through a range of physiological, behavioral, and/or cognitive responses.
Multi-dimensional Anxiety Theory (Martens et al[9])	This view holds that cognitive state anxiety is negatively related to performance, whereas somatic state anxiety is related to performance in an inverted-U manner.
Catastrophe Theory (Hardy and Parfitt[10])	This view holds that somatic anxiety is related to performance in an inverted-U fashion, but only when the individual has low cognitive state anxiety.
Individual Zones of Optimal Functioning Theory (Hanin[11])	Holds the view that elite-level performers have an optimal zone of arousal/anxiety where they are able to reach peak performances. If their arousal/anxiety is outside the zone (too low or too high), performance will decline.

performance to occur, each individual has an optimal zone of arousal/anxiety where they are able to reach peak perfor mances. If their arousal/anxiety is outside of the zone (too low or too high), performance will decline.

These theoretical relationships associated with sport-related performance anxiety have been among the most debated domains within sport psychology,[12] and empirical results appear to be inconsistent.[3] However, when examining the theoretical conceptualizations and empirical evidence[5,13–15] as a collective whole, few key tenets remain constant and are generally agreed upon: 1) sport-related anxiety has an effect on performance; 2) depending on the individual and the situation, such effect on performance can be either negative or positive; 3) and the direction of such effect on performance is typically a result of individual's cognitive, behavioral, and physiological responses to the potentially stressful sporting situation.

Sport performance: broadening the concept

It is important to note that sport-related anxiety is considered to be an unpleasant response generally associated with the stress of participating in sport. Traditionally, sport performance as a concept has included participation in activities that relate to regular practice and competition of ones' sport; however, more recently, this has also included performance in activities that relate to sport injury prevention, rehabilitation, and the return to sport process.[16] At first glance, these two domains may appear separate, however; it is one of the fundamental tenets of this paper that they should be viewed as interconnected. Thus far, research has highlighted that some of the antecedents of anxiety in practice and/or competition include increased intensity of the activity performed,[17,18] athlete's personality,[19,20] history and intensity of stressors,[21] and their existing coping strategies,[22] to name a few.

Coincidentally, the same stressors that have been found to facilitate the development of anxiety in practice or competitive settings are also likely to be contributors to sport injury occurrence.[23] Thus far, research has highlighted that an individual's poor stress response to a stressful practice or competitive situation can influence their increased risk of sport injury,[24–26] and that anxiety is one of the key personality factors that affect sport injury onset.[27–29] In a similar way, the same stressors will continue to influence subsequent injury rehabilitation and, if not addressed appropriately, can also impact physical and psychosocial rehabilitation outcomes,[30] as well as subsequent return to sport participation.[31] Given the ample research that has focused on the impact of anxiety on competitive sport performance,[5,13–15] and with the attempt to provide the reader with current insights into sport-related anxiety, the following sections will focus on the role of anxiety in one specific sport performance domain: sport injury occurrence, rehabilitation, and return to sport.

Anxiety and sport injury occurrence

Similar to the Smith and Smoll model[4], theoretical conceptualizations developed to explain sport injury occurrence have also centered around the cognitive appraisal physiological arousal stress response mechanism.[23,32] In short, Andersen and Williams' model[23,32] of stress and athletic injury proposes that when placed in a stressful athletic situation, the athlete will make cognitive appraisals of the following: the demands of the situation, their resources available, and the consequences of the potential outcomes of the situation. Known

as the stress response, such appraisals are said to interact bidirectionally with physiological/attentional aspects, resulting in increased muscle tension, narrowing of visual field, and increased distractibility. Based on the stress response, a person can increase or decrease their potential risk of encountering sport injury. This stress response is directly or indirectly mediated by bidirectional interaction between an individual's personality, history of stressors, and available coping resources. Moreover, the stress response can also be alleviated by implementing a range of psychosocial stress management-based interventions.[33] For more details on the model, please see Andersen and Williams' original work,[23,32] or a recent review of the literature pertaining to the model by Appaneal and Habif.[33]

The stress and athletic injury model[23,32] proposes that anxiety, as a personality variable, can act as an antecedent influencing the stress response–injury relationship.[32] Support for the aforementioned has been found in the literature.[24–29] Of all the personality variables studied to date, existing research has identified competitive trait anxiety as the most researched[33] and consistent variable associated with sport injury occurrence.[16,34] For example, in a recent critically appraised topic review of trait anxiety as a risk factor for musculoskeletal injury in athletes,[35] 66% of studies supported the competitive trait anxiety/musculoskeletal sport injury occurrence relationship. The study revealed that when competitive trait anxiety is considered in conjunction with other psychosocial variables such as cognitive worry, mood states like irritability, life stressors, and the presence of coping skills, it has the ability to predict athletic injury occurrence.[35] However, in isolation, its ability to predict injury occurrence is small,[35] providing further support to the multidimensional nature of the stress and athletic injury model.[23,32]

It is also likely that feelings of competitive trait anxiety that increase the risk of sport injury occurrence do not occur in isolation, but are rather intertwined with other cognitive appraisals related to the situation. For example, it is possible that the competitive trait anxiety–sport injury relationship is influenced by an athlete's perception of situational injury risk[36] and/or his/her perceived susceptibility to sport injury (PSSI).[37] Some limited evidence in support of the aforementioned exists. Prospective research on 434 adult hockey, soccer, and football players found a positive relationship between athletes' perceptions of injury risk (i.e., fear of being injured) and probability of injury occurrence.[38] The results from Reuter and Short[38] further demonstrated that athlete's level of worry and concern was also positively associated with injury occurrence. In addition, those athletes with history of previous injuries were least confident in their ability to avoid reinjury and subsequently also experienced higher probabilities of reinjury overall.[38]

An individual's PSSI has also been found to be associated with neuroticism,[39–41] a pertinent personality trait often related to trait anxiety.[42] Since researchers have yet to explore the role of anxiety in sport injury occurrence in great detail, it might be advisable to extend the research to include these constructs as well. It is likely that the range of cognitive appraisals related to injury risk and susceptibility such as PSSI, perceived situational injury risk, and fear of reinjury should be examined in combination with neuroticism and potentially other personality constructs should be considered as potential antecedents to trait and state anxiety in a sport injury occurrence context. Moreover, very recently, Brewer and Redmond[16] have argued that an "even more pertinent form of anxiety – 'sport injury trait anxiety' – may fare even better than competitive trait anxiety in predicting injury"; however, to date, no empirical evidence exists in support of such construct as it is yet to be formally conceptualized and measured. It must also be noted that, in general, empirical evidence for understanding psychosocial antecedents to anxiety in a sport injury occurrence is still in its infancy, and further prospective studies for greater clarification and understanding are required. However, based on the findings to date, it is known that anxiety as a co-antecedent to individual's response to a potentially stressful situation can amplify individual's risk of encountering a sport injury.

Anxiety and sport injury rehabilitation

Similar to competitive sport performance and sport injury occurrence contexts, existing theoretical conceptualizations[31] and empirical evidence has also acknowledged the role of stress and anxiety as part of the sport injury rehabilitation process. In fact, anxiety has been found to influence both orthopedic/musculoskeletal and concussion injuries alike.[43] Building on the pre-injury conceptualizations,[23,32] the Integrated Model of Psychological Response to the Sport Injury and Rehabilitation Process[31] presumes that following injury occurrence, the injury itself becomes a stressor that will be consequently cognitively appraised, resulting in bidirectional interaction between emotional and behavioral responses and any subsequent cognitive appraisals known as the dynamic

core.[31] Along with the preinjury factors as identified in the Andersen and Williams model,[23,32] the dynamic core is also influenced by a number of additional personal and situational factors, which can influence overall psychosocial and physical injury recovery outcomes. For more details on the Integrated model, please see the original work by Wiese-Bjornstal et al.[31]

The Integrated model[31] proposes that anxiety, as a personality variable, can influence sport injury rehabilitation and successful recovery outcomes in a number of ways. First, it can carry over from being a pre-injury factor influencing injury occurrence, to a personal factor influencing an individual's cognitive appraisals of the injury and the rehabilitation process.[31] Thus far, literature has suggested that immediately following an injury during the reaction to injury phase,[44] an athlete is likely to experience anxiety related to both the injury and the recovery process.[44,45] Once the athlete progresses to the rehabilitation phase,[44] anxiety is typically more likely to be associated with their performance in new rehabilitation activities and/or using the injured body part. A number of studies with sport medicine professionals such as athletic trainers and physiotherapists worldwide have also indicated that the prevalence of stress and anxiety are among the most pertinent factors distinguishing athletes who cope well with their injuries from those who do not.[46–50]

The relationship between stress/anxiety and coping with injuries is also strongly related to the physical progress an athlete makes during the rehabilitation process.[30] When physical progress is consistent with an athlete's own perceptions of rehabilitation success, it is likely that feelings of anxiety and other negative emotions/cognitive appraisals will decrease over time.[51] However, when such progress does not occur as desired, or at times of setbacks, anxiety is likely to increase, and an anxious athlete is at greater risk for developing feelings of depression, particularly when they also have a high sense of athletic identity.[52]

Anxiety and return to sport

The final phase of rehabilitation is concerned with an athlete's safe physical and psychosocial return to sport.[44] Often these two aspects are not valued equally,[16] and emphasis is often placed on the physical ability and readiness to return to sport. However, given the cyclical nature of cognitive appraisals, and emotional and behavioral responses during the sport injury rehabilitation process,[53,54] anxiety, as an emotional response, can significantly influence successful return to sport as well.

Thus far, research has identified fear and reinjury anxiety (often these terms are used interchangeably in the literature although they are not the same construct[55,56]) as the main concern for athletes during the return to sport process.[52,53,57–61] Research suggests that reinjury anxiety can negatively impact athletic performance after returning from injury.[41,57] An athlete may be hesitant to give 100% due to lack of confidence in the injured body part resulting in increased worry and tension. Podlog and Eklund[57] have argued that reinjury anxiety during the return to sport phase can be detrimental for an athlete as it can lead to an increased risk of reinjury or secondary injury. In addition, anxieties related to the inability and/or uncertainty to return to pre-injury level of performance and lack of athletic appearance[57,62] have been found to influence a successful return to sport process. Moreover, lack of athletic identity, feelings of isolation, and pressures to return to sport when the athletes themselves do not feel ready to return[52,57] are also typical emotional responses during the return to sport phase, and they are likely to increase anxiety if not addressed.

Addressing anxiety with athletes

Given the significance of anxiety in sport performance, it is important to ensure it is addressed early and by appropriately trained mental health professionals. Anxiety, even though it is a normal emotion experienced by many, if left unaddressed, can lead to more serious psychological disorders. Recognizing early signs and symptoms of anxiety typically fall on those professionals interacting with athletes on a daily basis. Any medically unexplainable changes in resting heart rate, or muscle tension should be noted, and when coupled with increases in life and sport-related stressors, sudden changes in mood, and emergence of unusual behaviors could be signs of increased stress and/or anxiety.

To help detect athletes at risk, it would be advisable for appropriately trained clinicians to implement valid and reliable mental health screening tools into pre-participation medical examinations. Such baseline measures can help later to identify any possible significant changes, and assist in early intervention and referral when necessary.[63] The baseline assessments can also be beneficial at the time of injury, which, if used by appropriately trained professionals, can also be beneficial in determining athletes' psychological readiness to return to sport.[64] For more details on how to conduct mental health screening and assess clinical issues with athletes, please see recent comprehensive text edited by Jim Taylor.[63]

In addition to assessment, a number of psychosocial interventions can be beneficial to help athletes cope with stressful situations and anxiety, in general. Depending on the

individual athlete's needs, these could be interventions that aim to provide athletes an ability to manage their unrealistic or irrational cognitive appraisals, debilitative emotional responses, nonbeneficial behaviors, and/or physiological symptoms. Some of the most commonly used psychosocial interventions include goal setting, imagery, relaxation strategies, self-talk, and social support.[2,65,66] As the aim of any psychological intervention is to assist the athlete in the development of self-regulatory skills,[67] and the intervention should be grounded in appropriate psychological theory and empirical evidence,[2] they should be designed and implemented by professionals trained to do so. It would be advisable to ensure we, as healthcare professionals, work together in a holistic, interprofessional manner[68–71] to ensure we deliver client-specific and practitioner competent care.[65]

Conclusion

The current article has discussed the role of anxiety in a range of sport-related performance situations. Since ample evidence exists for the role of sport-related anxiety in competitive settings,[5,13–15] the current article shifted its' focus to how anxiety affects other sport-related performance domains, namely, sport injury occurrence, rehabilitation, and return to sport.

Considering the original theoretical conceptualization by Smith and Smoll,[4] and the models of sport injury[23,30–32] together with the empirical evidence to date, it can be argued that sport-related anxiety can have a significant negative impact on the athlete. All of the theoretical conceptualizations reviewed are grounded in the cognitive appraisal physiological arousal relationship known as the stress response to a potentially stressful situation and highlight the importance of understanding anxiety as a psychophysical phenomenon.

If left unaddressed, sport-related anxiety can continue to have spiraling effects on an athlete's performance. In short, sport-related anxiety can 1) have a negative impact on sport performance during practice and competitions, 2) lead to increased risk of injury occurrence, 3) delay and obstruct injury rehabilitation and the return to sport process, and 4) increase subsequent reinjury risk during post-rehabilitation practice and competitions.

Given the above, those working with athletes should be mindful of how anxiety can influence athletes' cognitive appraisals, physiological arousals, and ultimately, performance in a range of performance related situations. Moreover, they should be mindful of how anxiety can transfer itself from one situation to another, and how this may vary depending on the athlete in question. It is also important to remember our role as part of a holistic, interprofessional team.[68–71] To appropriately recognize and treat sport-related anxiety, we as professionals must ensure that we provide each of the athletes we work with client-specific and practitioner competent care,[65] and refer to other professionals when necessary.[16]

Disclosure

The authors report no conflicts of interest in this work.

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