

# Anxiety Disorders in Athletes



Claudia L. Reardon, MD<sup>a,\*</sup>, Paul Gorczyński, PhD<sup>b</sup>,  
Brian Hainline, MD<sup>c</sup>, Mary Hitchcock, MA, MS<sup>d</sup>, Simon Rice, PhD<sup>e,f</sup>

## KEYWORDS

- Anxiety • Athletes • Sport • Performance anxiety • Psychiatry • Psychology
- Generalized anxiety • Panic disorder

## KEY POINTS

- Athletes experience many anxiety symptoms and disorders, including generalized anxiety disorder, panic disorder, and social anxiety disorder, at rates approximating those in the non-athlete population.
- Athletes may experience the anxiety-related disorders of obsessive-compulsive disorder and post-traumatic stress disorder at rates exceeding those in the non-athlete population.
- Sport- and non-sport factors may precipitate or worsen anxiety symptoms and disorders in athletes.
- Clinicians should take into account athletes' psychosocial context and physiology when treating athletes for anxiety symptoms and disorders.

## INTRODUCTION

Athletes experience a wide variety of mental health symptoms and disorders.<sup>1</sup> Among these are anxiety and related disorders, including generalized anxiety disorder (GAD), panic disorder, social anxiety disorder, obsessive-compulsive disorder (OCD), post-traumatic stress disorder (PTSD), separation anxiety disorder, specific phobia, and, while not specifically a diagnosis in the Diagnostic and Statistical Manual of Mental Disorders, competitive performance anxiety.<sup>1</sup> Anxiety disorders are among the most common mental health disorders around the world,<sup>2</sup> with earlier onsets than a majority of other mental health disorders.<sup>3</sup> A multitude of biopsychosocial factors incite and

<sup>a</sup> Department of Psychiatry, University of Wisconsin School of Medicine and Public Health, 6001 Research Park Boulevard, Madison, WI 53719, USA; <sup>b</sup> Psychology and Counselling, School of Human Sciences, University of Greenwich, Old Royal Naval College, Park Row, Greenwich SE10 9LS, UK; <sup>c</sup> National Collegiate Athletic Association, 700 West Washington Street, PO Box 6222, Indianapolis, IN 46206, USA; <sup>d</sup> University of Wisconsin-Madison, Ebling Library for the Health Sciences, 2339 Health Sciences Learning Center, 750 Highland Avenue, Madison, WI 53705, USA; <sup>e</sup> Orygen, 35 Poplar Road, Parkville, Melbourne, Australia; <sup>f</sup> Centre for Youth Mental Health, The University of Melbourne, Locked Bag 10, Parkville, Melbourne, Australia

\* Corresponding author.

E-mail address: [creardon@wisc.edu](mailto:creardon@wisc.edu)

perpetuate anxiety in this population.<sup>4</sup> Athletes with anxiety symptoms and disorders may present differently than other cohorts such that there are important considerations when it comes to diagnosing these conditions in this group.<sup>1</sup> Treatment mandates careful consideration of relevant psychosocial and physiologic factors as well. This paper provides a clinical review of GAD, panic disorder, social anxiety disorder, OCD, PTSD, separation anxiety disorder, specific phobia, and competitive performance anxiety in athletes across competitive levels.

## METHODS

An experienced academic librarian (MH) searched Cochrane, PsycINFO, PubMed, Scopus, and SportDiscus databases from inception until January 2023. Authors reviewed reference lists of the original articles for possible inclusion as well. They selected studies that were written in English and included clinical information on athletes and anxiety-related symptoms or disorders. Resources and manuscripts describing anxiety in non-athlete populations were included where sport-based research was unavailable.

## RESULTS

### *General Information on Anxiety in Athletes*

---

According to Schaal,<sup>5</sup> whose research involves a large sample of athletes with mental health disorders diagnosed by licensed clinicians, anxiety disorders across types affect athletes in a combined past 6-month prevalence of approximately 9%. This is comparable to rates reported in the general population (11%–12%).<sup>6,7</sup>

Other research has examined comparative rates of anxiety in different categories of sports. *Individual* sport athletes may be at relatively greater risk for anxiety than are *team* sport athletes.<sup>8–10</sup> Starting at younger ages, motivations for athletes to join individual sports tend to include goal-oriented reasons such as winning scholarships or controlling weight.<sup>8</sup> Conversely, athletes joining team sports tend to trace the origins of their participation to a desire to have fun with friends.<sup>8</sup> The former reasons may be more associated with an underlying anxious temperament or may be more prone to contribute to the development of anxiety. Individual sport athletes may also be relatively more perfectionistic, set extreme personal goals, internalize failure after loss, experience less social support, train in a single sport throughout the year (increasingly common in childhood sports), and suffer injuries, all of which may lead to anxiety.<sup>11,12</sup> Among specific individual sports, those in which judges score athletes (eg, gymnastics, figure skating, diving) are most highly correlated with anxiety.<sup>5</sup> These athletes experience pressure to distinguish themselves from their competition as they pursue flawlessness and judges' approval.<sup>5</sup>

Several other factors have been associated with higher risk for anxiety in athletes (**Table 1**).

Anxiety symptoms and disorders impact performance in sport. Anxiety affects attention, executive functioning, information selection, muscle tension, and stimulus processing—all of which are involved in sport.<sup>4</sup> Elite athletes reporting higher anxiety experience more skill errors and negative performance outcomes.<sup>24–26</sup> For example, anxiety impacts balance among youth and young adults participating in gymnastics and is associated with worse performance.<sup>27</sup> Additionally, an athlete's interpretation of stress and anxiety pre-competition may mediate the functional impact on performance.<sup>28</sup> That is, if the athlete interprets the feelings as helpful in getting “pumped up” for competition, that may be functionally adaptive. However, if the athlete perceives the feelings as detrimental, then behavioral responses are unhelpfully

<b>Domain of Factors Associated with Higher Risk for Anxiety in Athletes</b>	<b>Specific Factors</b>
Sport specific	<ul style="list-style-type: none"> <li>• Sense of pressure to perform<sup>13</sup></li> <li>• Public scrutiny<sup>13</sup></li> <li>• Sporting career uncertainty or dissatisfaction<sup>14,15</sup></li> <li>• Injury<sup>16–18</sup> (concussion and musculoskeletal injury reportedly equal risk)<sup>19</sup></li> <li>• Harassment and abuse in sport<sup>20</sup></li> </ul>
Non-sport specific	<ul style="list-style-type: none"> <li>• Female<sup>4,9,21</sup></li> <li>• Younger age<sup>4</sup></li> <li>• Recent experience of adverse life events (eg, recent death of a close friend or change in financial state)<sup>4</sup></li> <li>• Behavioral inhibition<sup>22</sup></li> <li>• Social withdrawal or avoidance<sup>22</sup></li> <li>• Rumination<sup>22</sup></li> <li>• Less religiosity<sup>23</sup></li> </ul>

Reprinted with permission in edited form from *Advances in Psychiatry and Behavioral Health*, Vol 1, Reardon CL, Gorczyński P, Hainline B, Hitchcock M, Purcell R, Rice S, Walton CC, Anxiety disorders in athletes: a clinical review, pages 149-160, Copyright Elsevier (2021).

avoidance-based, and performance negatively affected.<sup>29–31</sup> Finally, anxiety in athletes is one of the factors most consistently associated with sport injury occurrence<sup>31,32</sup> and severity.<sup>33</sup> After injury occurs, recovery from and return to sport can be negatively impacted by anxiety as well.<sup>34</sup> Notably, though, higher levels of satisfaction with social support received while injured are associated with *decreases* in post-injury anxiety symptoms.<sup>35</sup>

### **Generalized Anxiety Disorder**

Although the above research described non-specific “anxiety” in athletes, some research has examined specific anxiety-related disorders. For example, GAD is characterized by persistent and excessive worry about a number of different topics.<sup>36</sup> GAD in athletes appears to occur at similar rates (6.0% per clinician diagnosis<sup>5</sup> and 14.6% per self-report) as in the general population.<sup>37</sup> Like in non-athlete samples, female athletes report GAD more often than do male athletes.<sup>38–44</sup> Aesthetic sports (eg, artistic swimming, figure skating, gymnastics) across genders are associated with a higher risk for GAD among elite athletes.<sup>5</sup> Athletes in these sports have described feeling a lack of control over the outcome of their performances, which are judged by others.<sup>45</sup> Conversely, “high-risk sports,” which include aerial sports, motor sports, and sliding sports (eg, luge), are associated with relatively lower risk for GAD among elite athletes.<sup>5</sup> These sports have a relatively high risk of fatalities. Their athlete participants have been described as “thrill seekers,”<sup>46,47</sup> and they may cope better with stressful circumstances.<sup>48</sup> Other risk factors for GAD as reported in a study of collegiate athletes from China may include sport injury, attention-deficit/hyperactivity disorder, and a high level of fear of failure.<sup>49</sup> In that same population, satisfaction in sport was significantly protective against GAD.<sup>49</sup>

### **Panic Disorder**

Panic disorder is characterized by unexpected and recurrent episodes of intense fear accompanied by other symptoms such as a racing heartbeat or shortness breath, with

fear of future such episodes.<sup>36</sup> Approximately 4.5% of athletes self-report panic disorder symptoms,<sup>50</sup> approximating rates in the general population.<sup>51</sup> Exercise is known to be anxiolytic, but conversely, exercise can precipitate acute anxiety and panic attacks, with nearly one-third of patients with panic disorder and/or the related condition of agoraphobia (fear of open/crowded places, of leaving one's home, or of being in places from which escape is difficult) reporting increased anxiety while exercising.<sup>52</sup> Consequently, panic disorder sufferers may avoid exercise.<sup>53</sup> The relationship between exercise and panic attacks may owe to the physical experiences of exercise (eg, increased heart rate, shortness of breath, sweating), which resemble those of panic. The athlete with panic disorder may worry they are experiencing a panic attack, which perpetuates further panic symptoms.<sup>54</sup> Conversely, one study suggests that participation in adolescent sport might *decrease* the risk of panic disorder (more so than other anxiety disorders) in adulthood.<sup>55</sup> The authors of the latter hypothesize that sports participation acts as a form of exposure therapy such that youth learn not to fear symptoms such as increased heartbeat, rapid breathing, and sweating via desensitization to those symptoms.

### **Social Anxiety Disorder**

---

Social anxiety disorder (social phobia) is characterized by fear of being judged or negatively evaluated in a social or performance situation.<sup>36</sup> Those with the disorder avoid such situations or endure them with significant distress. By self-report, symptoms of social anxiety disorder impact 14.7% of athletes,<sup>50</sup> which is similar to the rate of 13% in the general population.<sup>51</sup> Significant fear of social evaluation, especially if extending to contexts beyond sport, warrants evaluation for this disorder.<sup>56</sup> It can be challenging in some cases to discern whether symptoms represent competitive performance anxiety or social anxiety disorder. In competitive performance anxiety, the symptoms are limited to sport participation, with fear of scrutiny by others not a driving factor, compared to social anxiety disorder, in which fears relate to negative evaluation by and interaction with others.<sup>57</sup> It is possible that encouragement of sports participation for socially reticent children and young adults may provide opportunities for repeated exposure to feared social situations, resulting in a reduction in social anxiety as they desensitize to these situations.<sup>58</sup> For others, pressure to perform in sports may perpetuate fears of being negatively evaluated in social settings.<sup>58</sup> The net "average" effect of sports participation on social anxiety is thus unknown.

There may be a correlation between social anxiety and avoidance of *individual* sports (where athletes may feel that they as an individual are being watched by many people), but not *team* sports (where spectator viewing is distributed across multiple athletes).<sup>58</sup> Athletes with social anxiety disorder may avoid meals and meetings with the team, media interviews, and rehabilitation exercises in the athletic training room where they may perceive that they are too much the center of attention. Some cases of social anxiety disorder, especially in youth, may be associated with selective mutism, where there is consistent failure to speak in specific social situations in which there is an expectation for speaking<sup>36</sup> (eg, during team sports participation). In all of these situations, the athlete tends to be focused on self rather than sport-related task, with potential resultant negative impact of social anxiety on performance.<sup>59</sup>

### **Obsessive-Compulsive Disorder**

---

OCD is characterized by recurring, unwanted thoughts, ideas or sensations (obsessions) that make the person feel driven to do something repetitively (compulsions).<sup>36</sup> By self-report, OCD has been found to impact 5.2% of collegiate athletes across 13 sports,<sup>60</sup> which is higher than general population rates (2.3%).<sup>61</sup> Moreover, in that

same self-report study, nearly 35% of athletes endorsed OCD *symptoms* without meeting full OCD criteria,<sup>60</sup> compared to 28% in the general population.<sup>62</sup> Similarly, a small study of professional tennis players carried out via self-report and clinical interview demonstrated rates of OCD symptoms higher in both active and retired players compared to controls.<sup>63</sup> In contrast, in the yearly psychiatric evaluations of French elite athletes, relatively fewer (1.6%) received an OCD diagnosis compared to the general population.<sup>5</sup> Despite the somewhat conflicting findings, researchers have hypothesized that perfectionism and the compliance to strict daily routines that sport mandates,<sup>63</sup> along with superstitions and rituals that can be taken to extremes,<sup>60</sup> may confer athlete vulnerability to OCD.

Dysfunction from OCD can ensue in sport if intrusive thoughts interfere with present moment attention or if the athlete cannot stop the obsessive-compulsive rumination or routine to engage in sport performance.<sup>59</sup> For example, an endurance runner may log more miles than proscribed if they feel compelled to repeatedly run back to a certain spot in the road to confirm that they did not inadvertently kick a rock into the way of forthcoming runners. A swimmer may need to repeat a lap unnecessarily if it took an odd (vs even) number of seconds to complete it.

It is imperative not to overdiagnose OCD in athletes who may engage in superstitious rituals. Such rituals are common in sport,<sup>59,60,63</sup> and seemingly peculiar routines in themselves do not warrant a diagnosis of OCD if they do not cause significant distress or dysfunction.<sup>1</sup> These behaviors may serve to offer a sense of predictability and routine to athletes, for whom other aspects of their sport environment (eg, how their opponent will perform, whether they become ill before competition, the weather, whether spectators will cheer or boo, how officials will call the competition) are unpredictable.<sup>56</sup> However, if rituals surrounding competition gradually become more time-consuming or extend beyond sport, clinicians should screen for OCD.<sup>56</sup> For example, if an athlete develops a routine of tying his shoelaces in a particular way before races, that may be a harmless and reassuring superstitious ritual. However, if it starts to take up increasing amounts of time before each race, to the point that warmups and actual races are missed because the shoelaces never feel “just right,” then OCD may be present. Ultimately, to be diagnosed as OCD, there is often an hour or more per day of obsessions and/or compulsions.<sup>36</sup>

### ***Post-Traumatic Stress Disorder***

PTSD is a disorder that may occur in someone who has experienced or witnessed a traumatic event and who then has intrusive thoughts and feelings and associated behavioral changes related to that event.<sup>36</sup> Rates of this disorder in athletes have been reported to be approximately 13%,<sup>64</sup> exceeding the 6% to 9% lifetime prevalence in the general population.<sup>65,66</sup> Major injury during sports participation is increasingly described as an inciting traumatic event,<sup>67</sup> and devastating humiliation, bullying, or harassment/abuse are among other events in sports that may lead to trauma-related symptoms. Female athletes, adolescent athletes (ie, those aged 15–21 years as compared to younger athletes), and those who have a stronger athletic identity may experience greater emotional trauma following injury.<sup>68</sup> Athletes with pre-existing trauma exposure who then suffer traumatic sports injury may also be at greater risk for PTSD.<sup>69</sup>

In athletes, symptoms of PTSD may include inconsistencies in athletic performance, increased somatic complaints, and avoidance symptoms specific to sport (eg, avoidance of rehabilitation exercises, of a return to the site where an injury occurred, of engagement in the type of activity being done when an injury occurred, or of training to full intensity), particularly where the inciting event involved athletic participation.<sup>67,70</sup>

The common approach of encouraging the athlete to “toughen up and get back out there” is unlikely to help if the symptoms go clinically unaddressed.

### ***Separation Anxiety Disorder***

---

Separation anxiety disorder is a relatively common anxiety disorder, particularly in youth, diagnosed when anxiety about separation from attachment figures is excessive for developmental age and interferes with school or other daily activities.<sup>36</sup> In affected athletes, the normal separation anxiety that exists in toddlers becomes *more* rather than *less* pervasive as the child becomes older. They often worry that harm will befall their attachment figure while they are separated.<sup>36</sup> This disorder has been little researched in athletes. However, when present, it can make it difficult for athletes to separate from their caretakers to attend sports practices or competition. They may be distracted at practice (if caregivers do not remain on site), step out of practice to send texts or place calls to caregivers to make sure they are okay, or experience somatic symptoms such as headaches or stomachaches, worrying that something will happen to their caregivers during that time. Typically, there will be a generalization of separation anxiety to multiple settings (eg, the athlete is fearful about leaving caregivers not only to attend sport-related activities but also to attend school, play dates, and birthday parties),<sup>36</sup> thereby distinguishing it from anxiety related to particular events happening in a single setting (eg, bullying at sports practice).

### ***Specific Phobia***

---

Specific phobia involves marked fear or anxiety about a specific object or situation.<sup>36</sup> The phobic object or situation is actively avoided or endured with intense fear or anxiety. Although rates of this condition in athletes are unknown, when present, it commonly develops prior to the age of 11 years.<sup>36</sup> Sport participation may present situations where specific phobias become particularly apparent, for example, in the case of sport-related travel involving airplanes or elevators, both of which are common specific phobias.<sup>36</sup> Loud sounds and costumed characters (such as mascots) are additional relatively common specific phobias<sup>36</sup> that may manifest in sport contexts. Finally, fear of vomiting or choking—also frequent phobias<sup>36</sup>—may result in insufficient dietary intake to support high levels of physical activity in sport.

### ***Competitive Performance Anxiety***

---

Competitive performance anxiety in sport is defined as fear an athlete has occurring around the time of sport participation, especially competition, that they will not be able to perform in the desired manner, that the situation will be too challenging, and/or that it will be dangerous or harmful.<sup>71</sup> This results in physiologic arousal, anxious cognitive appraisals, and/or anxious behavioral responses. It is important but often challenging to differentiate competitive performance anxiety, normal competition-induced hyperarousal, and full anxiety disorders.<sup>71</sup> Clinicians can distinguish among these 3 possibilities via observation of patterns of symptom onset, source(s) of the worry, duration, and severity of symptoms (**Table 2**).<sup>71</sup> Importantly, specific anxiety disorders such as GAD can co-exist and/or overlap with competitive performance anxiety.<sup>24,71,72</sup> Thus, suspicion for competitive performance anxiety should generate careful evaluation for overt anxiety disorders.

Competitive performance anxiety—like other types of anxiety—frequently brings with it several general physical symptoms. These symptoms include the typical “fight-flight-freeze” response symptoms such as dry mouth, flushed or pale skin, increased heart and respiratory rates, shakiness, and sweaty hands.<sup>71</sup> Additionally, numerous reports have been published describing how gastrointestinal disturbances

**Table 2**  
**Differentiation between normal competition-induced hyperarousal, competitive performance anxiety, and anxiety disorders**<sup>1,56,59,71</sup>

	<b>Normal Competition-Induced Hyperarousal</b>	<b>Competitive Performance Anxiety</b>	<b>Anxiety Disorder (eg, GAD)</b>
Pattern of symptom onset	Mild hyperarousal symptoms (eg, feeling mildly nervous) typically starting during the day before/of or during sport performance	Hyperarousal symptoms starting any time before or during sport performance	Anxiety symptoms present most days irrespective of performance times (though symptoms might become even worse before/during performance). In GAD, symptoms have been present at least 6 mo <sup>36</sup>
Source of worry	Performance in sport	Performance in sport	Worries that are often multiple (in the case of GAD) and that are not solely sport related
Duration	Typically <24 h	Variable; can be up to a week or more before performances	Ongoing
Severity	No negative impact on functioning or significant distress, and arousal to a certain degree may <i>improve</i> performance according to the “inverted-U” hypothesis <sup>73</sup>	Detrimental impact on sport performance and/or significant distress	Detrimental impact on life functioning outside of (and sometimes within) sport and/or significant distress

Reprinted with permission in edited form from *Advances in Psychiatry and Behavioral Health*, Vol 1, Reardon CL, Gorczynski P, Hainline B, Hitchcock M, Purcell R, Rice S, Walton CC, Anxiety disorders in athletes: a clinical review, pages 149-160, Copyright Elsevier (2021).

including cramping, diarrhea, nausea, regurgitation/reflux, urges to defecate, and emesis are fairly common around times of competition and even training, especially among endurance athletes.<sup>74</sup> These disturbances may relate to competitive performance anxiety<sup>74,75</sup> and/or trait (longstanding and not just situational) anxiety.<sup>76</sup>

Competitive performance anxiety can be distressing and highly dysfunctional for athletes. This type of anxiety may contribute to a “slump” (an extended period of performance at a level less than capability) or a “choke” (acute performance—especially in high stakes circumstances—at a level less than capability).<sup>77</sup> “The yips” describe a variant of a choke in which there is an involuntary movement during a sport task, especially in sports that require fine motor control such as bowling, cricket, darts, golf, or shooting.<sup>78</sup> For example, a golfer may experience a problematic jerk, posture, or tremor during chipping, full swing, or putting.<sup>79</sup> Research on the yips is minimal, but it may be relatively common and underdiagnosed.<sup>79</sup> A spectrum of etiologies may exist for the yips, ranging from competitive performance anxiety to a focal dystonia, with a continuum between the 2.<sup>78,79</sup> The 2 etiologies may be distinguishable based on if the involuntary movement occurs in low-stakes settings (eg, when the athlete

is hitting the golf ball by themselves), with focal dystonia a more prominent factor if it occurs even in these low-key settings.<sup>78</sup> Another variant of the yips may be the “twisties”—a potentially dangerous phenomenon in which gymnasts lose their sense of control in the air; it has been minimally studied but reportedly sometimes considered a dissociative symptom and related to stress and anxiety.<sup>80</sup> Regardless of how competitive performance anxiety manifests in a particular athlete, it can result in losses that are important to this population,<sup>57,81</sup> including loss of continued sport participation, ability to progress to the next competitive level, financial/scholarship/sponsorship support, and medals/championships.

Risk factors for competitive performance anxiety in athletes have been reported to include female gender,<sup>82</sup> younger age,<sup>82,83</sup> lower athletic experience,<sup>82</sup> away versus home competitions (exception being playing at home against nearby teams who are historic rivals),<sup>82</sup> athlete perception of coaching behaviors as controlling versus autonomy-supporting,<sup>84</sup> a sport environment in which athletes perceive that they are being rewarded only for being the best performer (vs for personal learning and improvement),<sup>85</sup> and individual versus team sports.<sup>82,86</sup> The reason younger age may be a risk is that athletes with greater experience appear to have more ability to control their distress and more effective coping strategies to deal with criticism from self and others.<sup>8,82</sup> Additionally, social media use shortly before or during competition, especially if push notifications are activated, is associated with competitive performance anxiety.<sup>87</sup> This type of media use may be a marker for baseline anxious traits, may increase comparisons to others, and/or may interfere with mental preparation for (which is important for confidence during) competition.<sup>87</sup>

### ***Other Anxiety-Related Disorders***

---

We found no research on other anxiety or related disorders, including adjustment disorder with anxiety or obsessive-compulsive personality disorder, in athletes. Adjustment disorder with anxiety may be common in this population owing to many temporary, sport-related stressors such as injury or competitive failure.<sup>88</sup>

### ***General Principles of Diagnosis and Management***

---

There are no known athlete-specific, comprehensive, validated screening tools for anxiety-related disorders. The International Olympic Committee (IOC) published its Sports Mental Health Assessment Tool 1 (SMHAT-1), which includes several screening tools presented together for use in athlete populations.<sup>89</sup> The SMHAT-1 incorporates the GAD-7—which appears to be an acceptable choice for athletes—as its general anxiety screening tool.<sup>89</sup> Clinicians may incorporate the entire SMHAT-1, or the GAD-7 if singularly wishing to screen for anxiety, into preparticipation physical examinations. Additionally, the IOC advises that screening with the SMHAT-1 be repeated after injury/illness or suspected harassment/abuse, if there are unexplained performance concerns, at the end of competitive cycles, during other adverse life events, and upon retirement from sport.<sup>89</sup> The Sport Anxiety Scale-2 may be used to screen specifically for competitive performance anxiety.<sup>90</sup>

Clinicians should always consider general medical and substance-related conditions that may contribute to anxiety symptoms (**Table 3**).<sup>56,71,91</sup> In the presence of such conditions, it is imperative to address these underlying contributors, in addition to managing the manifesting anxiety symptoms.

The primary treatment for mild to moderate anxiety in athletes—just as in the general population—is often psychotherapy.<sup>1,103,104</sup> Athletes may be more wary than non-athletes of potential medication side effects, thereby further leading them to psychotherapy as the first treatment option.<sup>1</sup> Psychotherapy providers who are familiar with



**Table 3**  
**Common general medical and substance-related conditions that may contribute to anxiety symptoms in athletes<sup>56,71,91</sup>**

General Medical or Substance-Related Condition	Signs/Symptoms that May Mimic Anxiety in Athletes	Relevance to Athletes	Typical Initial Evaluation	Typical Management
Anemia	<ul style="list-style-type: none"> <li>• Shortness of breath</li> <li>• Tachycardia</li> <li>• Fatigue</li> </ul>	<ul style="list-style-type: none"> <li>• Endurance athletes and athletes with unintentional underfueling or eating disorders may be at risk for anemia</li> </ul>	<ul style="list-style-type: none"> <li>• Hemoglobin and ferritin laboratory tests</li> </ul>	<ul style="list-style-type: none"> <li>• Increased dietary iron intake</li> <li>• Iron supplementation</li> </ul>
Asthma	<ul style="list-style-type: none"> <li>• Shortness of breath that may contribute to a sense of anxiety, panic, or impending doom</li> <li>• Tachycardia</li> </ul>	<ul style="list-style-type: none"> <li>• Asthma may be exercise-induced</li> <li>• Athletes in certain sports (eg, swimming) may have relatively high rates of asthma<sup>92</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Lung auscultation</li> <li>• Pulmonary function testing</li> </ul>	<ul style="list-style-type: none"> <li>• Beta-agonists (some are prohibited at higher levels of competition without therapeutic use exemptions)<sup>93</sup></li> <li>• Other daily controller medications</li> </ul>
Caffeine use	<ul style="list-style-type: none"> <li>• Nervousness</li> <li>• Restlessness</li> <li>• Jitteriness</li> <li>• Insomnia</li> <li>• Tachycardia</li> </ul>	<ul style="list-style-type: none"> <li>• Athletes may use caffeine to increase energy or enhance performance<sup>94,95</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Clinical interview</li> </ul>	<ul style="list-style-type: none"> <li>• If caffeine is causing problems, taper it (athletes consuming large doses may experience short-term withdrawal effects that may temporarily exacerbate anxiety)</li> </ul>
Concussion <sup>96</sup>	<ul style="list-style-type: none"> <li>• Nervousness</li> <li>• Irritability</li> <li>• Trouble concentrating</li> <li>• Insomnia</li> <li>• Fatigue</li> </ul>	<ul style="list-style-type: none"> <li>• Athletes experience sport-related concussion (SRC)</li> <li>• Anxiety symptoms may be multifactorial post-SRC</li> <li>• Athletes who have an anxious profile at baseline are likely to experience greater concussion symptom burden following SRC<sup>97</sup></li> <li>• Negative, anxiety-related perceptions about concussions are prevalent in collegiate athletes<sup>98</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Immediate clinical neurologic assessment</li> <li>• Serial symptom assessment</li> <li>• Possible neuropsychological testing</li> <li>• Possible neuroimaging</li> </ul>	<ul style="list-style-type: none"> <li>• Gradual return-to-sport and return-to-learn protocols. Having an accurate understanding of baseline anxiety levels for these athletes may help to inform return-to-learn and return-to-play decisions and may prevent athletes from being withheld from activity unduly<sup>99</sup></li> <li>• Symptom-targeted pharmacology as needed</li> <li>• Psychotherapy if mental health symptoms are persistent or severe</li> </ul>

(continued on next page)

**Table 3**  
(continued)

General Medical or Substance-Related Condition	Signs/Symptoms that May Mimic Anxiety in Athletes	Relevance to Athletes	Typical Initial Evaluation	Typical Management
Exercise-induced laryngeal obstruction (EILO) <sup>100</sup>	<ul style="list-style-type: none"> <li>• Episodic shortness of breath that can lead to acute anxiety/panic</li> </ul>	<ul style="list-style-type: none"> <li>• Symptoms occur during exercise, resolve within minutes of stopping exercise, and are especially common in adolescent female athletes</li> </ul>	<ul style="list-style-type: none"> <li>• Referral to otolaryngology</li> <li>• Spirometry before/after bronchodilator and bronchoprovocation challenge, with confirmation via continuous laryngoscopy during exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Behavioral management with speech-language pathologist</li> <li>• Management of psychosocial stressors related to EILO episodes</li> </ul>
Hypoglycemia <sup>101</sup>	<ul style="list-style-type: none"> <li>• Acute episodes of nervousness, jitteriness, irritability, and/or sweating</li> </ul>	<ul style="list-style-type: none"> <li>• High training demands with insufficient or poorly timed caloric intake may occur in athletes</li> <li>• Unintentional underfueling or eating disorders may be associated with hypoglycemia</li> </ul>	<ul style="list-style-type: none"> <li>• Glucose laboratory test while symptomatic</li> </ul>	<ul style="list-style-type: none"> <li>• Improved timing and composition of meals and snacks</li> </ul>
Thyroid dysfunction <sup>102</sup>	<ul style="list-style-type: none"> <li>• Palpitations</li> <li>• Tremors</li> <li>• Restlessness</li> <li>• Insomnia</li> <li>• Fatigue</li> </ul>	<ul style="list-style-type: none"> <li>• Overtraining in female athletes is associated with thyroid dysfunction</li> <li>• Iron deficiency (common in some athlete populations) is commonly comorbid with hypothyroidism</li> <li>• Athletes may use exogenous thyroid hormone to attempt to improve performance</li> </ul>	<ul style="list-style-type: none"> <li>• Thyroid function laboratory tests</li> </ul>	<ul style="list-style-type: none"> <li>• Medication</li> <li>• Sometimes radioactive thyroid ablation or thyroidectomy</li> </ul>

Reprinted with permission in edited form from *Advances in Psychiatry and Behavioral Health*, Vol 1, Reardon CL, Gorczynski P, Hainline B, Hitchcock M, Purcell R, Rice S, Walton CC, Anxiety disorders in athletes: a clinical review, pages 149-160, Copyright Elsevier (2021).

the psychosocial context of sport are usually most equipped to meet athletes' needs and preferences.<sup>105</sup>

There is a dearth of empirical evidence on the effectiveness of psychotherapeutic interventions for most mental health symptoms and disorders, including anxiety, in athletes.<sup>106</sup> Studies on therapeutic approaches have generally focused on performance enhancement rather than treatment of psychopathology, and between-subject designs and healthy athlete samples have disproportionately been included.<sup>106</sup> However, athletes with anxiety may do well with cognitive-behavioral therapy (CBT), given its structural components that are similar to sport: completion of homework, following of rules, and receiving instruction.<sup>103</sup> Elements may include arousal reduction for GAD or panic disorder, graded exposure and behavioral experimentation for social anxiety, separation anxiety, PTSD, and specific phobia, and response prevention for OCD.<sup>107</sup> For panic attacks exacerbated by general physical sensations during exercise, treating the panic symptoms via exposure—and discouraging phobic avoidance of exercise—is the recommended course.<sup>56</sup> Specific mental factors that are deemed important for success in sport—affect regulation, healthy coping mechanisms, maintenance of motivation and of supportive relationships, and self-confidence,<sup>4,108</sup>—simultaneously help in anxiety management.<sup>2</sup> Thus, focus on these factors can be high yield.

Other therapies may be beneficial as well. Mindfulness-based programs have demonstrated efficacy for anxiety symptoms in the general population,<sup>109</sup> and are increasingly popular among athletes.<sup>110</sup> A systematic review and meta-analysis demonstrated reduced symptoms of anxiety in elite athletes participating in these programs, though adequately powered trials are required in the future.<sup>111</sup> Nutritional support may be helpful for athletes experiencing gastrointestinal manifestations of anxiety during sport.<sup>75</sup> Finally, a meta-analysis has demonstrated an anxiolytic effect of exercise for people with anxiety and related disorders.<sup>112</sup> Although presumably athletes are getting adequate exercise such that there would be no room for anxiolytic gain in this regard, it is one factor (of many) to consider if their anxiety increases during times of break from sport. Moreover, location of exercise matters regarding degree of anxiolytic (possibly moreso than for antidepressant) impact.<sup>113</sup> Outdoor exercise appears more beneficial than indoor exercise, and specifically a systematic review and meta-analysis that included 16 studies reporting outcomes for anxiety has demonstrated that exercise undertaken in outdoor *green natural* environments versus outdoor *urban* environments is significantly more anxiolytic.<sup>113</sup>

Medications may be necessary to treat anxiety in athletes—either as monotherapy or added to psychotherapy—especially when symptoms are moderate to severe.<sup>1</sup> However, prescribers should be aware of side effects that could compromise sport performance or safety.<sup>114</sup> Selective-serotonin reuptake inhibitors (SSRIs) are antidepressants that tend to be first choice of medications for athletes across anxiety disorders.<sup>115</sup> Specifically, a survey study has shown that the top choices of sports psychiatrists for anxiety in athletes are escitalopram, sertraline, and fluoxetine.<sup>115</sup> Of these, fluoxetine has received modest study in exercising subjects and has not been found to have a negative performance impact.<sup>116,117</sup> However, performance measures that may not be fully translatable to competitive sport, short study duration, lack of subject diversity, and small sample size were limitations in these studies. Escitalopram and sertraline have not been studied in athletes, but anecdotally they are frequently used in this population.<sup>115</sup> Tricyclic antidepressants (TCAs) are also used for anxiety-related disorders (especially clomipramine for OCD) in general populations, but they have been even less studied in athletes than have SSRIs. Clinicians should monitor blood levels of these medications in anyone taking them, as blood

levels that are too high can be dangerous and cause severe side effects.<sup>1</sup> This may be especially important for athletes, as cardiac consequences of toxic blood levels may be dire in this heavily exercising cohort. Furthermore, eating disorders are generally considered contraindications to use of TCAs, and given the overrepresentation of eating disorders among athletes, this is another reason that these medications would not be used in this population.<sup>118</sup>

Another medication, buspirone, is a partial agonist of serotonin receptors that is used for its anxiolytic effects. One small study suggested impaired performance in recreational athletes.<sup>119</sup> However, only a single 45 mg dose was tested—far from duration and dose used in the real world—such that translation to use in actual athletes is not possible.<sup>119</sup>

Medications are rarely indicated for competitive performance anxiety.<sup>1</sup> Benzodiazepines, which can be used as fast-acting, as-needed options for acute anxiety in the general population, are prone to impair sport performance. They may cause sedation or muscle relaxation and decrease reaction time.<sup>57,120–122</sup> Propranolol and other beta-blockers may decrease cardiopulmonary capacity<sup>123</sup> and lower blood pressure (and thus cause dizziness) in athletes who may already have low blood pressure.<sup>1</sup> Additionally, the World Anti-Doping Agency prohibits beta-blockers both *out-of-competition* and *in-competition* in archery and shooting, and *in-competition* in automobile, billiards, darts, golf, some skiing/snowboarding, and some underwater sports.<sup>93</sup> The National Collegiate Athletic Association prohibits beta-blockers in rifle.<sup>124</sup> In these sports, beta-blockers may be performance enhancing by reducing physiologic tremor and thus improving fine motor control.<sup>1</sup> As a result, psychotherapy is the preferred choice for management of competitive performance anxiety,<sup>57</sup> and it has been demonstrated to be effective per meta-analysis and systematic review.<sup>125</sup> Athletes need practice in modulating and interpreting the feelings of being “psyched up” during competition just as they need practice in the other physical aspects of sport. Additionally, while sometimes used, pharmacologic options including benzodiazepines and botulinum toxin have been minimally studied in the treatment of the yips.<sup>79</sup> Behavioral approaches to address the yips, depending on sport, may include development of a new biomechanical sequence while engaging in the problematic motion, change in grip technique or length/type of golf club or other implement used, or hypnosis.<sup>79</sup> For the twisties, training on soft surfaces until the problem passes has been suggested, but none of these strategies have been rigorously evaluated.<sup>80</sup>

Athletes at higher levels of competition (especially collegiate and beyond) must exercise caution if using any non-regulated supplements to manage anxiety. Athletes sometimes prefer “natural” products, but high levels of competition enforce strict prohibitions of certain substances.<sup>93,124</sup> There is no regulatory body that approves the accuracy of supplement labels or the safety of supplement contents before they are sold. Dietary supplements may thus be contaminated—unbeknownst to the athlete—with prohibited substances.<sup>1</sup> Inaccurate labeling of supplements and ignorance of ingredients are not recognized as valid excuses for adverse analytical findings on drug tests.<sup>1</sup> Therefore, if supplements are taken, they should be obtained from a reputable company and ideally certified by a third-party program that tests for substances prohibited in sport.<sup>1</sup> Beyond the concern about contamination, several supplements marketed for anxiety (eg, kava, valerian) may cause sedation,<sup>91</sup> which could impact sports performance. Recently, cannabidiol (CBD) has been marketed to athletes as helpful for anxiety, among other conditions, but there is inadequate research to encourage its use for this purpose.<sup>126</sup> Moreover, athletes consuming CBD risk ingesting a relatively small amount of associated tetrahydrocannabinol (THC), which is prohibited by

several governing bodies.<sup>93,124</sup> In the rare instance athletes have been included as the target population when studying the impact of supplements on anxiety, sample sizes have generally been low.<sup>127</sup>

## DISCUSSION

Athletes may suffer from the full complement of anxiety symptoms and disorders that manifest in the general population, albeit often with nuanced precipitating and perpetuating factors and symptom presentations. If providers are aware of the risk factors and sometimes subtle presentations of anxiety in this population, they can intervene sooner. For example, the athlete in an individual, aesthetic, judged sport who is suffering from an injury, has a known eating disorder, and receives much pressure from family to maintain full scholarship support is likely at high risk for anxiety, and screening for such disorders should be undertaken liberally. Intervention as soon as possible may help prevent progression from mild symptoms to full, disabling disorders that make continued participation in sport—and life—difficult.

Clinicians should consider athletes' unique biopsychosocial contexts when making treatment recommendations. Anecdotally, athletes sometimes worry that treatment of anxiety might negatively impact sport performance via lessening of their anxiety-driven conscientiousness and strong work ethic; however, the authors found no evidence to justify this concern. On the contrary, there is ample evidence that ongoing anxiety negatively impacts sport performance in a variety of ways. Nonetheless, clinicians should be aware of the potential relevance of medication side effects in sport. Preliminary research on performance impacts of daily SSRI controller medication is reassuring, but limitations in study methods are substantial. Clinicians should thus solicit input from individual athletes about how they perceive medications to be impacting them and should take such reports seriously, as athletes are generally highly attuned to any changes in how their bodies are functioning.

Clinicians who provide mental health care to athletes who are suffering from anxiety ideally should be well-versed in the anxiogenic aspects of sport culture. They should not need their athlete patients to educate them about the stressors unique to life as an athlete. Their providers should not glamorize or idolize their athlete patients; in contrast, they should appreciate that the reality of their lives is demanding and full of pressures from many angles. At the same time, athletes do not necessarily want to be advised by their psychotherapist that their sport is too stressful and that they should simply quit. Clinicians should strive to find an adequate balance between being alert for problematic circumstances in sport (eg, abuse, playing through severe pain or injury) that warrant intervention (and possibly help exiting that particular sport context), while not rushing to a stance of, "Well then just quit if it's so bad." Additionally, clinicians should be aware of the relative mental health benefits of sport when pursued for the enjoyment it affords, versus the more negative impacts when associated with demanding, pressure-filled, lonely pursuits of individual perfection. It may be appropriate to help an athlete develop insight into their anxious tendencies, how their chosen sport may perpetuate those tendencies, and how such tendencies can be managed.

## SUMMARY

Athletes are susceptible to the full spectrum of anxiety symptoms and disorders. Manifestations of such symptoms are varied, and there should be a low index of suspicion for their presence. Effective treatment should be employed promptly to optimize functioning in sport and in life.

## CLINICS CARE POINTS

- Clinicians should ask all athletes if they spend a lot of time feeling anxious or worried, with use of more formal screening if possible.
- If a clinician suspects an anxiety-related disorder in an athlete, they should seek to confirm the diagnosis, discuss treatment (specifically psychotherapy and medications) and referral options with the athlete, and make an intervention promptly.

## DISCLOSURE

The authors have nothing to disclose.

## REFERENCES

1. Reardon CL, Hainline B, Aron CM, et al. Mental health in elite athletes: International Olympic Committee consensus statement (2019). *Br J Sports Med* 2019; 53(11):667–99.
2. Whiteford HA, Ferrari AJ, Degenhardt L, et al. The global burden of mental, neurological and substance use disorders: an analysis from the of Disease Study 2010. *PLoS One* 2015;10:e0116820.
3. Kessler RC, Berglund P, Demler O. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Arch Gen Psychiatry* 2005;62(6):593–602.
4. Rice SM, Gwyther K, Santesteban-Echarri O, et al. Determinants of anxiety in elite athletes: a systematic review and meta-analysis. *Br J Sports Med* 2019; 53:722–30.
5. Schaal K, Tafflet M, Nassif H, et al. Psychological balance in high level athletes: gender-based differences and sport-specific patterns. *PLoS One* 2011;6: e19007.
6. Somers JM, Goldner EM, Waraich P, et al. Prevalence and incidence studies of anxiety disorders: a systematic review of the literature. *Can J Psychiatry* 2006; 51:100–13.
7. Wittchen H-U, Jacobi F. Size and burden of mental disorders in Europe—a critical review and appraisal of 27 studies. *Eur Neuropsychopharmacol* 2005;15: 357–76.
8. Pluhar E, McCracken C, Griffith KL, et al. Team sport athletes may be less likely to suffer anxiety or depression than individual sport athletes. *J Sports Med Sci* 2019;18(3):490–6.
9. Correia M, Rosado A. Anxiety in athletes: gender and type of sport differences. *Int J Psychol Res* 2019;12(1):9–17.
10. Gligor S, Oravitan M, Pantea C. Anxiety of students practicing competitive sports: part of a vicious circle, or not? *South Afr J Res Sport Phys Educ Recr* 2021;43(2):47–58.
11. Nixdorf I, Frank R, Hautzinger M, et al. Prevalence of depressive symptoms and correlating variables among German elite athletes. *J Clin Sport Psychol* 2013; 7(4):313–26.
12. Nixdorf I, Frank R, Beckmann J. Comparison of athletes' proneness to depressive symptoms in individual and team sports: research on psychological mediators in junior elite athletes. *Front Psychol* 2016;7:893.

13. Hodge K, Smith W. Public expectation, pressure, and avoiding the choke: a case study from elite sport. *Sport Psychol* 2014;28:375–89.
14. Brown CJ, Webb TL, Robinson MA, et al. Athletes' retirement from elite sport: A qualitative study of parents and partners' experiences. *Psychol Sport Exerc* 2019;40:51–60.
15. Gustafsson H, Hassmén P, Kenttä G, et al. A qualitative analysis of burnout in elite Swedish athletes. *Psychol Sport Exerc* 2008;9:800–16.
16. Lavallée L, Flint F. The relationship of stress, competitive anxiety, mood state, and social support to athletic injury. *J Athl Train* 1996;31(4):296–9.
17. Ivarsson A, Johnson U. Psychological factors as predictors of injuries among senior soccer players. A prospective study. *J Sports Sci Med* 2010;9(2):347–52.
18. Kilic Ö, Aoki H, Goedhart E, et al. Severe musculoskeletal time-loss injuries and symptoms of common mental disorders in professional soccer: a longitudinal analysis of 12-month follow-up data. *Knee Surg Sports Traumatol Arthrosc* 2018;26:946–54.
19. Sabol J, Kane C, Wilhelm MP, et al. The Comparative Mental Health Responses Between Post-Musculoskeletal Injury and Post-Concussive Injury Among Collegiate Athletes: A Systematic Review. *Int J Sports Phys Ther* 2021;16(1):1–11.
20. Mountjoy M, Brackenridge C, Arrington M, et al. International Olympic Committee consensus statement: harassment and abuse (non-accidental violence) in sport. *Br J Sports Med* 2016;50:1019–29.
21. Weber ML, Dean J-HL, Hoffman NL, et al. Influences of mental illness, current psychological state, and concussion history on baseline concussion assessment performance. *Am J Sports Med* 2018;46:1742–51.
22. Leach LS, Christensen H, Mackinnon AJ, et al. Gender differences in depression and anxiety across the adult lifespan: the role of psychosocial mediators. *Soc Psychiatry Psychiatr Epidemiol* 2008;43:983–98.
23. Guntoro TS, Putra MFP. Athletes' religiosity: How it plays a role in athletes' anxiety and life satisfaction. *HTS Theolog Stud* 2022;78(1):8.
24. Halvari H, Gjesme T. Trait and state anxiety before and after competitive performance. *Percept Mot Skills* 1995;81(3\_suppl):1059–74.
25. Morgan WP, O'Connor PJ, Ellickson KA, et al. Personality structure, mood states, and performance in elite male distance runners. *Int J Sport Psychol* 1988;19:247–63.
26. Turner PE, Raglin JS. Variability in precompetition anxiety and performance in college track and field athletes. *Med Sci Sports Exerc* 1996;28:378–85.
27. Ariza-Vargas L, Dominguez-Escribano M, Lopez-Bedoya J, et al. The effect of anxiety on the ability to learn gymnastic skills: a study based on the schema theory. *Sport Psychol* 2011;25(2):127–43.
28. Rice SM, Purcell R, De Silva S, et al. The mental health of elite athletes: a narrative systematic review. *Sports Med* 2016;46:1333–53.
29. Hatzigeorgiadis A, Chroni S. Pre-competition anxiety and in-competition coping in experienced male swimmers. *Int J Sports Sci Coach* 2007;2:181–9.
30. Jones G, Hanton S, Swain A. Intensity and interpretation of anxiety symptoms in elite and non-elite sports performers. *Pers Individ Dif* 1994;17:657–63.
31. Ford JL, Ildefonso K, Jones ML, et al. Sport-related anxiety: current insights. *Open Access J Sports Med* 2017;8:205–12.
32. Garit JR, Surita YP, Dominguez EF, et al. Anxiety and psychological variables of sports performance related to injuries in high-performance sportsmen. *Apunts Sports Med* 2021;56:211.

33. Pal S, Kalra S, Awasthi S. Influence of Stress and Anxiety on Sports Injuries in Athletes. *J Clin Diag Res* 2021;15(4):YE01–5.
34. Coronado RA, Bley JA, Huston LJ, et al. Composite psychosocial risk based on the fear avoidance model in patients undergoing anterior cruciate ligament reconstruction: Cluster-based analysis. *Phys Ther Sport* 2021;50:217–25.
35. Sullivan L, Ding K, Tattersall H, et al. Social support and post-injury depressive and anxiety symptoms among college-student athletes. *Int J Environ Res Public Health* 2022;19(11):6458.
36. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Publishing; 2013.
37. Du Preez EJ, Graham KS, Gan TY, et al. Depression, anxiety, and alcohol use in elite rugby league players over a competitive season. *Clin J Sport Med* 2017;27:530–5.
38. Junge A, Feddermann-Demont N. Prevalence of depression and anxiety in top-level male and female football players. *BMJ Open Sport Exerc Med* 2016;2:e000087.
39. Brand R, Wolff W, Hoyer J. Psychological symptoms and chronic mood in representative samples of elite student-athletes, deselected student-athletes and comparison students. *School Mental Health* 2013;5:166–74.
40. Yang J, Peek-Asa C, Corlette JD, et al. Prevalence of and risk factors associated with symptoms of depression in competitive collegiate student athletes. *Clin J Sport Med* 2007;17:481–7.
41. Lancaster MA, McCrea MA, Nelson LD. Psychometric properties and normative data for the brief symptom Inventory-18 (BSI-18) in high school and collegiate athletes. *Clin Neuropsychol* 2016;30:321–33.
42. Weber S, Puta C, Lesinski M, et al. Symptoms of anxiety and depression in young athletes using the hospital anxiety and depression scale. *Front Physiol* 2018;9:1–12.
43. Gerber M, Holsboer-Trachsler E, Puhse U, et al. Elite sport is not an additional source of distress for adolescents with high stress levels. *Percept Mot Skills* 2011;112:581–99.
44. Ivarsson A, Johnson U, Podlog L. Psychological predictors of injury occurrence: a prospective investigation of professional Swedish soccer players. *J Sport Rehabil* 2013;22:19–26.
45. Kerr G, Goss J. Personal control in elite gymnasts: the relationships between locus of control, self-esteem and trait anxiety. *J Sport Behav* 1997;20:69–82.
46. Carton S, Morand P, Bungenera C, et al. Sensation-seeking and emotional disturbances in depression: relationships and evolution. *J Affect Disord* 1995;34:219–25.
47. Michel G, Carton S, Jouvent R. Sensation seeking and anhedonia in risk taking. Study of a population of bungee jumpers. *Encephale* 1997;23:403–11.
48. Larkin M, Griffiths M. Dangerous sports and recreational drug-use: rationalizing and contextualizing risk. *J Commun & Appl Soc Psychol* 2004;14:215–32.
49. Li C, Fan R, Sun J, et al. Risk and protective factors of generalized anxiety disorder of elite collegiate athletes: a cross-sectional study. *Front Public Health* 2021;9:607800.
50. Gulliver A, Griffiths KM, Mackinnon A, et al. The mental health of Australian elite athletes. *J Sci Med Sport* 2015;18:255–61.
51. Bandelow B, Michaelis S. Epidemiology of anxiety disorders in the 21st century. *Dialogues Clin Neurosci* 2015;17:327–35.



52. Cameron OG, Hudson CJ. Influence of exercise on anxiety level in patients with anxiety disorders. *Psychosomatics* 1986;27:720–3.
53. Broocks A, Meyer TF, Bandelow B, et al. Exercise avoidance and impaired endurance capacity in patients with panic disorder. *Neuropsychobiology* 1997;36:182–7.
54. Strohle A, Graetz B, Scheel M, et al. The acute antipanic and anxiolytic activity of aerobic exercise in patients with panic disorder and healthy control subjects. *J Psychiatr Res* 2009;43:1013–7.
55. Ashdown-Franks G, Sabiston CM, Jewett R, et al. The association between adolescent socioeconomic status, sport participation and early adulthood anxiety. London, ON: Presented at Canadian Society for Psychomotor Learning and Sport Psychology; 2014.
56. Reardon CL. Psychiatric comorbidities in sports. *Neurol Clin* 2017;35:537–46.
57. Patel DR, Omar H, Terry M. Sport-related performance anxiety in young female athletes. *J Pediatr Adolesc Gynecol* 2010;23:325–35.
58. Northon PJ, Burns JA, Hope DA. Generalization of social anxiety to sporting and athletic situations: gender, sports involvement, and parental pressure. *Depress Anxiety* 2000;12:193–202.
59. Chang CJ, Putukian M, Aerni G, et al. Mental health issues and psychological factors in athletes: detection, management, effect on performance, and prevention: American Medical Society for Sports Medicine Position Statement. *Clin J Sport Med* 2020;30(2):e61–87.
60. Cromer L, Kaier E, Davis J, et al. OCD in college athletes. *Am J Psychiatr* 2017; 174:595–7.
61. Goodman WK, Grice DE, Lapidus KAB, et al. Obsessive-compulsive disorder. *Psychiatr Clin North Am* 2014;37:257–67.
62. Ruscio AM, Stein DJ, Chiu WT, et al. The epidemiology of obsessive-compulsive disorder in the National Comorbidity Survey Replication. *Mol Psychiatry* 2010; 15:53–63.
63. Marazziti D, Parra E, Amadori S, et al. Obsessive-compulsive and depressive symptoms in professional tennis players. *Clin Neuropsychiatry* 2021;18(6): 304–11.
64. Thomson P, Jaque S. Visiting the muses: creativity, coping, and PTSD in talented dancer and athletes. *Am J Play* 2016;8:363–78.
65. Goldstein RB, Smith SM, Chou SP, et al. The epidemiology of DSM-5 posttraumatic stress disorder in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions-III. *Soc Psychiatry Psychiatr Epidemiol* 2016;51:1137–48.
66. Van Ameringen M, Mancini C, Patterson B, et al. Post-traumatic stress disorder in Canada. *CNS Neurosci Ther* 2008;14:171–81.
67. Aron CM, Harvey S, Hainline B, et al. Post-traumatic stress disorder (PTSD) and other trauma-related mental disorders in elite athletes: a narrative review. *Br J Sports Med* 2019;53(12):779–84.
68. Padaki AS, Noticewala MS, Levine WN, et al. Prevalence of posttraumatic stress disorder symptoms among young athletes after anterior cruciate ligament rupture. *Orthop J Sports Med* 2018;6(7). 2325967118787159.
69. Cloitre M, Stolbach BC, Herman JL, et al. A developmental approach to complex PTSD: childhood and adult cumulative trauma as predictors of symptom complexity. *J Traum Stress* 2009;22:399–408.
70. Lynch JH. Posttraumatic Stress Disorder in Elite Athletes. *Curr Sports Med Rep* 2021;20(12):645–50.

71. Reardon CL, Gorczyński P, Hainline B, et al. Anxiety disorders in athletes. *Adv Psych Behav Health* 2021;1(1):149–60.
72. Guillén F, Sánchez R. Competitive anxiety in expert female athletes: sources and intensity of anxiety in national team and first division Spanish basketball players. *Percept Mot Skills* 2009;109:407–19.
73. Yerkes RMD, Dodson JD. The relation of strength of stimulus to rapidity of habit formation. *J Comp Neurol Psychol* 1908;18(5):459–82.
74. Wilson PB, Russell H, Pugh J. Anxiety may be a risk factor for experiencing gastrointestinal symptoms during endurance races: An observational study. *Eur J Sport Sci* 2021;21(3):421–7.
75. Wilson PB, Fearn R, Pugh J. Occurrence and impacts of gastrointestinal symptoms in team-sport athletes: a preliminary survey. *Clin J Sport Med* 2022;33(3):36476634.
76. Wilson PB. The psychobiological etiology of gastrointestinal distress in sport: a review. *J Clin Gastroenterol* 2020;54(4):297–304.
77. Diotaiuti P, Corrado S, Mancone S, et al. An Exploratory Pilot Study on Choking Episodes in Archery. *Front Psychol* 2021;12:585477. <https://doi.org/10.3389/fpsyg.2021.585477>.
78. Adler CH, Temkit M, Crews D, et al. The yips: methods to identify golfers with a dystonic etiology/golfer's cramp. *Med Sci Sports Exerc* 2018;50(11):2226–30.
79. Dhungana S, Jankovic J. Yips and other movement disorders in golfers. *Mov Disord* 2013;28(5):576–81.
80. Yu G, Chang KF, Shih IT. An exploration of the antecedents and mechanisms causing athletes' stress and twisties symptom. *Heliyon* 2022;8(10). e1104036276731.
81. Martorell MS, Ponseti FJ, Prats AN, et al. Competitive anxiety and performance in competing sailors. *Retos* 2021;39:187–91.
82. Rocha VVS, Oso rio FL. Associations between competitive anxiety, athlete characteristics and sport context: Evidence from a systematic review and meta-analysis. *Rev Psiquiatr Clin* 2018;45:67–74.
83. Madsen EE, Hansen T, Thomsen SD, et al. Can psychological characteristics, football experience, and player status predict state anxiety before important matches in Danish elite-level female football players? *Scand J Med Sci Sports* 2020;32(Suppl 1):150–60.
84. Cho S, Choi H, Youngsook K. The relationship between perceived coaching behaviors, competitive trait anxiety, and athlete burnout: a cross-sectional study. *Int J Environ Res Public Health* 2019;16(8):1424.
85. Pineda-Espejel HA, Alarcón E, Morquecho-Sánchez R, et al. Adaptive Social Factors and Precompetitive Anxiety in Elite Sport. *Front Psychol* 2021;12:651169.
86. Kemarat S, Theanthong A, Yeemin W, et al. Personality characteristics and competitive anxiety in individual and team athletes. *PLoS One* 2022;17:12022, 44175-001.
87. Encel K, Mesagno C, Brown H. Facebook use and its relationship with sport anxiety. *J Sports Sci* 2017;35(8):756–61.
88. McDuff DR. Adjustment and anxiety disorders. In: Currie A, Owen B, editors. *Sports psychiatry*. Oxford, United Kingdom: Oxford University Press; 2016. p. 1–16.
89. Gouttebauge V, Bindra A, Blauwet C, et al. International Olympic Committee (IOC) Sport Mental Health Assessment Tool 1 (SMHAT-1) and Sport Mental

- Health Recognition Tool 1 (SMHRT-1): towards better support of athletes' mental health. *Br J Sports Med* 2021;55(1):30–7.
90. Smith RE, Smoll FL, Cumming SP, et al. Measurement of multidimensional sport performance anxiety in children and adults: The Sport Anxiety Scale-2. *J Sport Exerc Psychol* 2006;28(4):479–501.
  91. Locke AB, Kirst N, Shultz C. Diagnosis and management of generalized anxiety disorder and panic disorder in adults. *Am Fam Phys* 2015;91(9):617–24.
  92. Fisk MZ, Steigerwald MD, Smoliga JM, et al. Asthma in swimmers: a review of the current literature. *Phys Sportsmed* 2010;38(4):28–34.
  93. World anti-doping agency prohibited list 2023. In: World Anti-Doping Agency (WADA). Available at: [https://www.wada-ama.org/sites/default/files/2022-09/2023list\\_en\\_final\\_9\\_september\\_2022.pdf](https://www.wada-ama.org/sites/default/files/2022-09/2023list_en_final_9_september_2022.pdf). Accessed January 23, 2023.
  94. Pickering C, Kiely J. What should we do about habitual caffeine use in athletes? *Sports Med* 2019;49(6):833–42.
  95. Guest NS, VanDusseldorp TA, Nelson MT, et al. International society of sports nutrition position stand: caffeine and exercise performance. *J Int Soc Sports Nutr* 2021;18(1):1.
  96. Reardon CL. Psychiatric manifestations of sport-related concussion. *Curr Psychiatr* 2020;19(7):22–8.
  97. Champigny C, Roberts SD, Terry DP, et al. Acute Effects of Concussion in Adolescent Athletes With High Preseason Anxiety. *Clin J Sport Med* 2022;32(4):361–8.
  98. Beidler E, Eagle S, Wallace J, et al. Anxiety-related concussion perceptions of collegiate athletes. *J Sci Med Sport* 2021;24(12):1224–9.
  99. Thomas GA, Guty ET, Riegler KE, et al. Affective comorbidity or concussion: Can we tell the difference? *Transl Issues in Psychol Sci* 2022;2023:31554.
  100. Wilson JJ, Wilson EM. Practical management: vocal cord dysfunction in athletes. *Clin J Sport Med* 2006;16(4):357–60.
  101. Brun JF, Dumortier M, Fedou C, et al. Exercise hypoglycemia in nondiabetic subjects. *Diabetes Metab* 2001;27(2 Pt 1):92–106.
  102. Luksch J, Collins PB. Thyroid disorders in athletes. *Curr Sports Med Rep* 2018;17(2):59–64.
  103. Stillman MA, Glick ID, McDuff D, et al. Psychotherapy for mental health symptoms and disorders in elite athletes: a narrative review. *Br J Sports Med* 2019;53(12):767–71.
  104. Vu V, Conant-Norville D. Anxiety: Recognition and Treatment Options. *Psychiatr Clin North Am* 2021;44(3):373–80.
  105. Castaldelli-Maia JM, de Mello e Gallinaro JG, Falcao RS, et al. Mental health symptoms and disorders in elite athletes: a systematic review on cultural influences and barriers to athletes seeking treatment. *Br J Sports Med* 2019;53:707–21.
  106. Ekelund R, Holmström S, Stenling A. Mental Health in Athletes: Where Are the Treatment Studies? *Front Psychol* 2022;13:781177.
  107. Clark DA, Beck AT. Cognitive therapy of anxiety disorders: science and practice. New York: Guilford Press; 2010.
  108. Burns L, Weissensteiner JR, Cohen M. Lifestyles and mindsets of Olympic, Paralympic and world champions: is an integrated approach the key to elite performance? *Br J Sports Med* 2019;53(13):818–24.
  109. Hofmann SG, Gomez AF. Mindfulness-based interventions for anxiety and depression. *Psychiatr Clin North Am* 2017;40(4):739–49.

110. Moreton A, Wahesh E, Schmidt CD. Indirect effect of mindfulness on psychological distress via sleep hygiene in division I college student athletes. *J Am Coll Health* 2022;70(7):1936–40.
111. Myall K, Montero-Marin J, Gorczynski P, et al. Effect of mindfulness-based programmes on elite athlete mental health: a systematic review and meta-analysis. *Br J Sports Med* 2023;57(2):99–108.
112. Ramos-Sanchez CP, Schuch FB, Seedat S, et al. The anxiolytic effects of exercise for people with anxiety and related disorders: An update of the available meta-analytic evidence. *Psychiatr Res* 2021;302:114046.
113. Wicks C, Barton J, Orbell S, Andrews L. Psychological benefits of outdoor physical activity in natural versus urban environments: A systematic review and meta-analysis of experimental studies. *Appl Psychol Health Well Being* 2022; 14(3):1037–61.
114. Reardon CL, Factor RM. Sport psychiatry: a systematic review of diagnosis and medical treatment of mental illness in athletes. *Sports Med* 2010;40:961–80.
115. Reardon CL, Creado S. Psychiatric medication preferences of sports psychiatrists. *Phys Sportsmed* 2016;44(4):397–402.
116. Parise G, Bosman MJ, Boecker DR, et al. Selective serotonin reuptake inhibitors: their effect on high-intensity exercise performance. *Arch Phys Med Rehabil* 2001;82:867–71.
117. Meeusen R, Piacentini M, Van Den Eynde S, et al. Exercise performance is not influenced by a 5-HT reuptake inhibitor. *Int J Sports Med* 2001;22:329–36.
118. Marvanova M, Gramith K. Role of antidepressants in the treatment of adults with anorexia nervosa. *Ment Health Clin* 2018;8(3):127–37.
119. Marvin G, Sharma A, Aston W, et al. The effects of buspirone on perceived exertion and time to fatigue in man. *Exp Physiol* 1997;82:1057–60.
120. Johnston A, McAllister-Williams RH. Psychotropic drug prescribing. In: Currie A, Owen B, editors. *Sports psychiatry*. Oxford: Oxford University Press; 2016. p. 133–43.
121. Paul MA, Gray G, Kenny G, et al. Impact of melatonin, zaleplon, zopiclone, and temazepam on psychomotor performance. *Aviat Space Environ Med* 2003;74: 1263–70.
122. Charles RB, Kirkham AJ, Guyatt AR, et al. Psychomotor, pulmonary and exercise responses to sleep medication. *Br J Clin Pharmacol* 1987;24:191–7.
123. Cowan DA, abuse D, Harries M, et al. In: *Oxford textbook of sports medicine*. New York: Oxford University Press; 1994. p. 314–29.
124. NCAA Banned Substances. In NCAA Sport Science Institute. 2023. Available at: <https://www.ncaa.org/sports/2015/6/10/ncaa-banned-substances.aspx>. Accessed 20 January 2023.
125. Ong NCH, Chua JHE. Effects of psychological interventions on competitive anxiety in sport: A meta-analysis *Psychol Sport. Exerc* 2021;52:101836.
126. Lachenmeier DW, Diel P. A warning against the negligent use of cannabidiol in professional and amateur athletes. *Sports (Basel)* 2019;7(12):251.
127. Salleh RM, Kuan G, Aziz MNA, et al. Effects of Probiotics on Anxiety, Stress, Mood and Fitness of Badminton Players, *Nutrients*, 13 (6), 2021, 1783. doi: 10.3390/nu13061783.