Acta Kinesiologica 19 (2025) Supplement 1
DOI. 10.51371/issn.1840-2976.2025.19.S1.1

Systematic Review

Mental health symptoms and disorders in elite athletes: A systematic review

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Purpose: Findings of recent reviews show that the prevalence of mental health symptoms and disorders among both current and former elite athletes appears to be substantial and similar to the prevalence in the general population. The aim of the current systematic review was to determine the prevalence of distress, anxiety and depression symptoms, sleep disorders, nutrition disorders, and substance use in elite active athletes.
Methods: The searches for articles were conducted in July 2024, in scientific journals indexed in the PsycNet, PubMed, SportDiscus, Scopus and ScienceDirect databases, with a search period from 1st January 2020 to July 31, 2024.
Results: A total of 1505 potentially relevant citations were retrieved, the review included 28 articles. The prevalence of psychological distress in both male and female athletes is approximately 17%. Moderate to severe generalized anxiety occurs in 5-9% of male athletes and 12-25% of female athletes. In the case of depression, the results are therefore more diverse, depending not only on cultural factors, but also on the measurement tool. A higher prevalence of depression was shown in female athletes. A high risk of eating disorders was found in several to a dozen or so percent of athletes. At least a dozen or so percent of athletes have sleep problems, and these difficulties occur more often in women. The prevalence of alcohol misuse varies greatly depending on the study group (15-77%), usually higher in men than in women.
Conclusions: The prevalence of mental disorders among elite athletes is higher in women than men and at least as high as in the general population. It does not differ significantly from that determined in earlier reviews and varies depending on cultural factors and sport practiced.

Key words: distress, anxiety, depression, eating disorders, professional athletes

Introduction

Systematic reviews and meta-analyses show that one in five adults has experienced a mental disorder in the past 12 months, and almost one in three adults in their lifetime[1]. The prevalence of common mental disorder varies depending on region. The highest lifetime prevalence was found in English-speaking countries. Countries within North and Southeast Asia displayed lower one-year and lifetime prevalence rates than other regions. One-year prevalence was also low among Sub-Saharan-Africa[1]. Mental health symptoms and disorders, especially anxiety, depression, substance abuse, and eating disorders, are more frequently reported in young adult populations than in other age groups. Elite athletes are most often found in this age group. Mental health symptoms and disorders have been increasingly studied in elite athletes over the past decade. Findings of recent reviews show that the prevalence of mental health symptoms and disorders among both current and former elite athletes appears to be substantial and similar to the prevalence in the general population[2]. Both the transition to elite level and retirement from sport can be a difficult period for professional athletes, with an increased risk of developing mental health symptoms and disorders.

Faced with these facts, in 2017 the International Olympic Committee (IOC) convened an international panel of 27 experts to thoroughly review the available scientific literature on mental health symptoms and disorders among active and former elite athletes (at professional, Olympic or university level)[3]. Panel members conducted narrative and systematic reviews of the prevalence, diagnosis, screening, treatment and management of mental health symptoms and disorders in elite sport. A multi-scan search strategy was used in relevant electronic databases (e.g., PubMed, SportDiscus, PSycINFO, Scopus) for articles published up to November 2018 using predefined eligibility criteria. The results of reviews and meta-analyses formed the basis of the IOC consensus on the mental health of elite athletes[4]. The results of the meta-analysis conducted by Gouttebarge et al.[2] will be presented as a reference for the current review, as their search strategy was repeated in the current update review. As a supplement, selected results from other reviews and meta-analyses conducted in 2019 as part of the project under the auspices of the IOC will be presented[3].

Among the 22 studies reviewed by Gouttebarge et al.[2], 11 studies reported the prevalence of stress symptoms among 3335 elite male and female athletes (aged 16 to 29 years) from various sports. The meta-analysis found that 19.6% (95% CI: 16.0 to 23.3) of elite athletes reported stress symptoms (high heterogeneity between studies: Q= 77.1, $P< .001$, $\wedge 2= 85.7\%$)[2]. Nine studies[2] reported prevalence rates of anxiety/depression among 2895 elite athletes from different sports. The meta-analysis showed that 33.6% (95% CI: 27.4 to 39.7) of elite athletes reported anxiety/depression symptoms (high heterogeneity between studies: Q=109.737, $P< .001$, $\wedge 2= 91.799\%$). Two studies reported prevalence rates of panic disorder, which ranged

from 1% to 5%[2].

A meta-analysis of ten studies[2] on the prevalence of sleep disorders symptoms among 4782 elite athletes from different sports disciplines showed that 26.4% (95% CI: 21.6 to 31.2) of elite athletes reported sleep disorders symptoms (high heterogeneity between studies: Q= 133.651, *P*< .001, ∧2= 92.518%).

Eleven studies included in the review by Gouttebarge et al.[2] reported the prevalence of alcohol abuse symptoms among 5555 elite athletes from different sports disciplines: the meta-analysis showed that 18.8% (95% CI: 11.1 to 26.5) of elite athletes reported alcohol abuse symptoms (high heterogeneity between studies: Q= 910.896, *P*< .001, ∧2= 98.79%). Additional analyses[5] found that elite athletes were most likely to use alcohol, cannabis, tobacco (nicotine), and prescribed opioids and stimulants, although the prevalence of use was lower than in the general population.

Seven cross-sectional studies reported data on eating disorders or adverse eating habits, with prevalence rates ranging from 1% to 28%[2].

The update of the data obtained by Gouttebarge et al.[2] is justified due to the increasing prevalence rates of mental disorders in the general population[6], especially during the COVID-19 epidemic[7,8]. The second reason is that the IOC panel members' analyses did not consider cultural factors. Meanwhile, culture contributes to differences in (a) the prevalence of mental disorders, (b) the aetiology and course of illness, (c) the phenomenology or expression of distress, (d) diagnosis and assessment, (e) coping styles and help-seeking pathways, and (f) treatment and intervention[9]. Sports psychologists emphasize that socio-cultural factors should be considered when analysing the mental health of athletes. Common mental disorders manifest themselves differently in athletes from different ethnic groups and require culturally adapted methods of diagnosis and treatment[10]. Therefore, it is worth taking this factor into account when analysing the results of studies on prevalence of mental disorders in athletes.

The aim of the current systematic review was to determine the prevalence of distress, anxiety and depression symptoms, sleep disorders, nutrition disorders, and substance use in elite active athletes. It included articles published from 2020 onwards.

Methods

This systematic review of the literature followed the criteria recommended by the PRISMA Declaration – Preferred Reporting Items for Systematic Reviews and Meta-Analyses[11].

Search strategy

The searches for articles were conducted in July 2024, in scientific journals indexed in the PsycNet, PubMed, SportDiscus, Scopus and Science Direct databases, with a search period from 1st January 2020 to July 31 2024. The publication period largely overlapped with the COVID-19 pandemic. As the aim of the study was to determine the universal prevalence of mental health symptoms and disorders in elite athletes, studies whose purpose was related to the pandemic were excluded from the current review.

A search strategy replicated the strategy used by Gouttebarge et al.[2] in their 2019 review and meta-analysis and was built based on two groups of keywords (and related search terms): 'mental health disorders' („mental health" OR „mental disorder" OR „mental illness" OR „mentally ill") and 'elite athletes' (elite OR professional OR Olympic OR „high performance" OR „high performing").

Eligibility criteria and study selection

Eligibility criteria for inclusions were:

1. Population: current athletes with elite or professional or international/national status at least 16 years of age;
2. Research methods: standardized measurement scales with established psychometric properties or professional psychiatric diagnosis;
3. Studies: full original articles from per-revied journals published in English;
4. Articles containing data on the occurrence of mental disorders/mental health problems (distress, depression, anxiety, sleep disorders, eating disorders, problematic use of psychoactive substances) determined on the basis of standardized measurement scales with cut-off points or established in a psychiatric examination.

Exclusion criteria were:

1. Population: collegiate athletes;
2. Population: athletes and non-athletes population combined as a single group;
3. The purpose of the study related to the COVID pandemic;
4. Non-peer-reviewed journal articles (including conference abstracts, theses and dissertations);
5. Secondary data analysis articles (meta-analysis, reviews);
6. Abstracts, editorial or commentaries, letters to the editors, case study or case reports.

To initially identify potentially relevant articles, titles and abstracts were screened using the eligibility criteria. If the title and abstract did not contain sufficient information to determine whether the eligibility criteria were met, they were included in the texts included in the full-text review. The full texts of all eligible articles after this initial screening were then assessed using the eligibility criteria.

Data extraction

For the analysis and discussion of the results, the following data were extracted: the authors, title, journal, DOI, year of publication, purpose, study design, study population characteristics (sample size, age, ratio of men to women, country, sport discipline), measure of mental disorders/mental health problems (scales, cut-off point), prevalence of mental disorders/ mental health problems, differentiating factors, comparison with general population.

Results

Search strategy

This study adhered to the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[11]. A total of 1505 potentially relevant citations were retrieved. After removing 451 duplicates, 1054 citations remained. When titles and abstracts were analysed for inclusion criteria, 81 potentially relevant studies were included in the full-text review. Of these, 53 studies were excluded for various reasons. Finally, our systematic review included 28 original studies. The PRISMA flow chart of the search procedure is presented as Figure 1.

Eleven articles presented the results of studies conducted before the COVID-19 pandemic, three after the pandemic; the time of conducting seven other studies fell partly during the pandemic. In seven articles the time of conducting the study was not specified. Detailed descriptions of the articles included in the review are presented in Table 1.

Study design

The majority of studies used a cross-sectional design (n=23) followed by cohort design (n=3). One study used a longitudinal design and another used a sequential design.

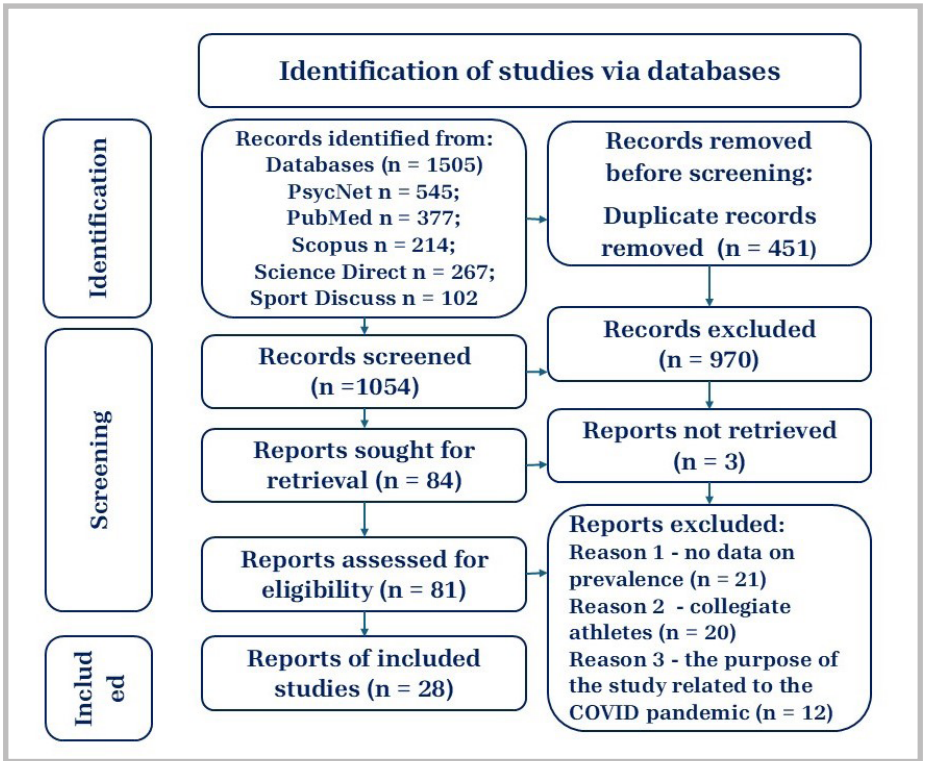

Figure 1. Flow diagram of study selection (PRISMA)

Variables studied

The most common subject of the study was anxiety and various anxiety disorders (15 articles) and depression (15 articles), 13 dealt with stress, and 11 with eating disorders. In addition, problems related to the use of alcohol (9) and other psychoactive substances (2), sleep difficulties (6), gambling (2), and exercise addiction (1) were examined. Two articles analysed mental disorders that were the reason for hospitalization.

Participants

Thirteen studies involved athletes from many disciplines. When the study involved athletes from one discipline, it was most often football (five studies). Additionally, rugby, Gaelic football, field hockey, judo, wrestling, hurling, swimming, canoeing, gymnastics, and horseracing were studied. In three cases, no information was provided about the sports discipline.

Regarding the nationality of athletes, the studies were most often conducted in Australia and Sweden (four articles each) and Great Britain and Spain (three articles each). Two studies were conducted in Ireland, Germany, Japan, and the USA. The remaining studies involved athletes from Finland, Denmark, Norway, Switzerland, Canada, and countries from the Oceania region.

The majority of studies (n=22) included mixed cohorts (3342 men and 3280 women in total). Five articles included all-female cohort (n=1104) and two included all-male cohort (n=6258).

One study (n=378) did not specify the gender of the participants. A total of 14,362 people participated in the studies included in this part of the review.

Research tools

The primary measure of anxiety was *Generalized Anxiety Disorder* (*GAD-7*) scale (12 studies). One study used *the Depression, Anxiety, and Stress Scale* (*DASS-21*), and another used *Hopkins Symptoms Check List* (*HSCL-10*). *Hamilton Anxiety Scale (HARS)* was used in one study.

The primary measures of depression were the *Patient Health Questionnaire (PHQ-9)* (six studies) and the *Center for Epidemiological Studies Depression Scale* (*CES-D*) (four studies. One study used *Hopkins Symptoms Check List* (*HSCL-10*), and another used the *Montgomery-Åsberg Depression Rating Scale - Self report (MADRS-S)*. The *Depression, Anxiety, and Stress Scale* (*DASS-21*) as well as the *Male Depression Risk Scale* (*MDRS*) were used in one study.

The primary stress scales were the *Kessler Psychological Distress Scale* (*K-10*) (six studies), the *Perceived Stress Scale* (*PSS*) (two studies). The *Depression, Anxiety and Stress Scale* (*DASS- 21*), as well as the *Athlete Psychological Strain Questionnaire* (*APSQ*) were used in one study. One study used *Distress Thermometer*, and another one *The Distress Screener*. Stress Response Scale for Athletes (one study).

The most commonly used methods for assessing eating disorders were the *Eating Attitudes Test* (*EAT-26*) (four studies) and the *Eating Disorder Examination Questionnaire* (*EDEQ*) (three studies). Two studies used the *Eating Disorders Inventory* (*EDI*), and two other studies used the *Brief Eating Disorder in Athletes Questionnaire* (*BEDA-Q*). The *SCOFF Questionnaire Screens for Eating Disorders* was used in two study. The *Bulimic Investigatory Test, Edinburgh* (*BITE*) was used in one study.

Sleep disorders were examined using the following scales: the *Pittsburgh Sleep Quality Index* (*PSQI*) (two studies), the Athlete *Sleep Screening Questionnaire* (*ASSQ*) (two studies), the *Berlin Sleep Apnoea Questionnaire*, the *Berben Insomnia Scale* (*BIS*) and the *Sleep Difficulty Score* (*SDS*).

To examine alcohol abuse, the *Alcohol Use Disorders Identification Test – Consumption (AUDIT-C)* was used in eight studies. The *Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers Adapted to Include Drugs* (*CAGE-AID*) and the *Drug Use Disorders Identification Test* (*DUDIT*) were used to assess drug misuse.

In addition, the studies used: *General Health Questionnaire* (*GHQ-28*) to assess common mental health symptoms, *Problem Gambling Severity Index* (*PGSI*), the *Canadian Problem Gambling Index* (*CPGI*), *Exercise Addition Inventory* (*EAI*).

Methodological quality

In the case of studies on the prevalence of mental disorders among elite athletes, methodological quality assessment tools developed for population-based medical studies, such as the Critical Appraisal Tools for use in JBI Systematic Reviews[12], are not applicable due to the different method of sample selection.

Table 1. Articles included in the systematic review in alphabetical order by author's surname.

Article	Aim	Study design; year	Study population	Outcomes measures	Prevalence (%), differences by gender and sport	Other outcomes	General population	Methodological quality (out of 15)
Abbot et al.[29]	Prevalence of disordered eating (DE) in elite male and female soccer players	Cross-sectional; 2018	Elite athletes N=207 Age: M 21±5 (18-39); F 23±4 (18-40) Gender: M 134 66.2%; F 73 33.8% Nationality: UK (England, Scotland) Sport: soccer Controls: Non-athletes (N=179)	EAT-26: DE risk ≥ 20 The Clinical Perfectionism Questionnaire	DE risk: M 15% (controls 5%) F 11% (controls 25%) No differences between M and F.	M soccer players higher EAT-26 scores than controls (10.4±9.9 vs. 6.8±6.7); EAT-26 scores and prevalence of DE risk higher in F controls (EAT-26 13.9±11.6) than soccer players (10.0±9.0).		15
Åkesdotter et al[.2]2	Mental health problems (MHP) in elite athletes (prevalence, sex-differences, onset, recurrent episodes, help-seeking, psychiatric diagnoses).	Cross-sectional; 2017	Elite athletes N=333 Age: 18+; 24.6±3.1 Gender: M 137 41.1%, F 196 58.9%. Nationality: Sweden Sport: many disciplines	GAD-7: mild anxiety≥ 5; moderate≥10; severe≥15), PHQ-9: mild depression≥ 5, moderate≥ 10; moderate/severe≥ 15, severe≥ 20, AUDIT-C: M at risk≥ 5; F at risk≥ 4, Adult ADHD Self-Report Scale: likely≥ 17, very likely≥ 24, Perceived Stress Scale, Overtraining Syndrome, Competitive State Anxiety Inventory-2, Athlete Burnout Questionnaire	Anxiety: moderate symptoms:12.6% severe symptoms: 4.2% (F 16.8% and 5.6%, M 6.6% and 2.2%, *P*< .001). Depression: moderate symptoms 14.7%; severe symptoms 3.6% (F 20.4% and 5.6%, M 6.6% and 0.7%, *P*< .001); 19.5% reached the moderate clinical cut-offs for symptoms of anxiety and/or depression (F 26.0%, M 10.2%). ADHD 5.4% (F 5.1%, M 5.8%). Hazardous drinking 25.8% (F 24.5%, M 27.7%)	Point prevalence of MHP 11.7% (F 13.8%, M 8.8%), lifetime prevalence 51.7% (F 58.2%, M 42.3%, *P*= .006). 24.4% athletes with a history of MHP reported one episode, 27.9% two episodes and 47.7% ≥3 episodes. The first onset peaked around 19 years of age (with 50%/ of onsets between ages 17–21). 29.1% reported seeking help (F 37.8%, M 16.8%, P= .001). A professional psychiatric diagnosis 8.1% (F 10.7%, M 4.4%), 29.6% of them had received more than one diagnosis.	Sweden: 5.2% -at least one contact with psychiatric care; 17.2% - clinical levels of depression 10.8% - clinical levels of anxiety, and of those, nearly 50% had symptoms of a comorbid psychiatric disorder.	14 (selection*)

Åkesdotter et al.[39]	The prevalence of psychiatric disorders among treatment-seeking elite athletes in psychiatric outpatient settings	Retrospecti-vely analysed clinical cohort, February 2015 - May 2021	Elite athletes - patients at two psychiatric outpatient treatment clinics in Stockholm and Malmö, N=221 Age: 23.5±5.9 Gender: M 68 30.8% F 153 69.2%: Nationality: Sweden Sport: NS	Descriptive overview of elite athletes with psychiatric disorders	Anxiety disorder 69%, stress-related disorders 25%, affective disorders 51%, eating disorders 26% (F 37%, M n<5; *P*< .001), disorders due to psychoactive substance 6% (F n<5; M 14%; P= .01). More than one psychiatric disorder 65% (two diagnoses 26%, >2 diagnoses 39%).	7% of elite athletes had at least one contact with specialised psychiatric care in 2020.	Sweden: 5.2% at least one contact with specialised psychiatric care in 2020	15
Aquino-Llinares et al.[24]	The anxiety levels, possible consequences for health	Cross-sectional; after COVID-19 pandemic	High level (HLA) and high performance (HPA) athletes N=47, HLA 23 (48.9%), HPA 24 (51.1%) randomly selected Age: 23.8 Gender: F (100%) Nationality: Spain Sport: canoeing	GAD-7: mild anxiety≥ 5; moderate≥10; severe≥ 15, EAT-26: low risk≥ 10; high risk≥ 20.	Anxiety: 32% moderate/high risk of anxiety: minimal HLA 10.6%; HPA 8.5%; slight 29.8%, 19.1%, moderate 6.4% 14.9%; high 2.1%, 8.5%. Eating disorders: 66% no risk, 19.1% low risk and 14.9% high risk	HPA: higher anxiety levels, greater risk of eating disorders.		11 (aim, sample, selection, limitations*)

Bilgoe et al.[20]	Prevalence rates of mental health symptoms and associations of severe injury and related surgery with mental health symptoms	Observational prospective cohort study, over a 12-month follow-up period, with follow-up questionnaires 6 (T1) and 12 (T2) months later, NS	Professional athletes N=74 Age 25.0± 2.7 Gender: F (100%) Nationality: Australia Sport: soccer	Athlete Psychological Strain Questionnaire: high risk for athletic distress≥ 17; GAD-7: moderate/ severe≥ 10 PHQ-9: moderate/ severe≥ 10); shortened Athlete Sleep Screening Questionnaire (ASSQ): moderate sleep disturbance≥ 8; AUDIT-C: alcohol misuse ≥ 3; Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers Adapted to Include Drugs: drug misuse≥ 2; Brief Eating Disorder in Athletes Questionnaire (BEDA-Q): disordered eating≥ 2.	Sport-related psychological distress high risk: T0 64.9%; T1 52.9%; T3 55.4% Moderate anxiety T0 6.8% T1 5.7%, T3 9.2% Moderate depression T0 5.4% T1 10.0% T3 9.2% Moderate sleep disturbance T0 24.3%, T1 31.4%, T2 32.3% Alcohol misuse T0 45.9%, T1 48.6% T2 41.5% Substance misuse T0 1.4%, T1 0.0%, T3 3.1% Disordered eating T0 17.6%, T1 18.9%, T2 15.4%	F professional football players were nearly twice as likely to report sport-related psychological distress following every surgery	Australia: anxiety/ depression 4%, alcohol misuse 2%, drug misuse 0.5%. Psychological distress in the working population 5-18%	15
Bonet et al[.38]	Mental health of the Villarreal Soccer Club's players and the possible mediating effects of sex and professional category	Cross-sectional, September 2020 - July 2022	Villarreal Club de Fútbol (CF) soccer team N=54 Gender: M 33 61%, F 21 39% Age: 23.4±4.6 Nationality: Spain Sport: soccer	International Neuropsychiatric Interview 5.0 (MINI); Hamilton Anxiety Scale no cut-off point; Hamilton Depression Scale: absence of depression ≤ 7, slight/ minor depression≥ 8, moderate depression ≥ 14, severe depression ≥ 19.	Diagnosis of a mental health disorder (MHD) 26.2%: agoraphobia 7.3%, generalized anxiety disorder 7.3%, alcohol dependence 5%, bulimia nervosa 5%.	Mental health treatment 24.1%, psycho-active drugs 7.4%, suicide attempt 1,8%, self-harm threatened 2.1%.	Spain: MHD 29%, psycho-active drugs 18.1%, self-harm 2.7%, mental health treatment 26.2%; psychological 20.8%, psychiatric 17.6%.	14 (selection*)

Edlund et al.[53]	Changes in symptoms of eating disorders, compulsive exercise, and depression, between two assessments 12	Longitudinal study using baseline and 1-year follow-up, 2016	National team N=94 (both measurements) Age: NS Gender M: 41 44% F:53 56%; Nationality: Sweden Sport: gymnastics	EDI-3: at risk of eating disorders: drive for thinness≥12 or body dissatisfaction≥19 Compulsive Exercise Test; Montgomery-Åsberg Depression Rating Scale-Self report, moderate depression≥20; severe depression≥35	Baseline and follow-up: the drive for thinness: 4% and 12%; body dissatisfaction: 3% and 9%, elevated drive for thinness and/or body dissatisfaction: 5% and 16%; moderate depression 2%, moderate or severe depression 6% at follow-up; eating disorder symptoms 17%	Little change over time in eating disordered behaviors and depression.	Sweden: 38% of university students - at least mild concern with their shape	15
Flores et al[18]	Frequency and predictors of eating disorders,	Cross-sectional; October 2022	Elite athletes N=22 Age: 20.8±2.8 Gender: F (100%) Nationality: Spain Sport: wrestling	EAT-26: eating disorder risk>20; the Bulimic Investigatory Test, Edinburgh (BITE) Symptom Scale: an unusual eating pattern≥10, bulimia nervosa≥20; Severity Scale: clinically significant≥5; high degree of severity≥10 EDI-3: at risk of developing eating disorders>20 DASS-21: mild depression>5, mild anxiety>4 mild stress>8	Depression depressive symptoms 50%, mild 27.3%, moderate 9.1%, severe 9.1%, extr. severe 4.5%. Anxiety anxiety symptoms 59.1%, mild 22.7%, moderate 13.7%, severe 4.5%, extr. severe 18.2%. Stress symptoms 54.5%, mild 13.7%, moderate 27.3%, severe 9.1%, extr. severe 4.5%. Eating disorders risk 40.9%	Fasting a whole day – 50%, using diuretics – 40%, using laxatives - 33.3%, vomiting to lose weight – 10%, binge eating – 50%, 10% at least two or three times per week.	Spain: Scores were clearly higher than those of a similar age and gender in the general population	13 (aim, project*)

Geiger et al.[19]	Mental health of elite athletes	Cross-sectional study, December 2021 - December 2022	Elite athletes N=275 Age: 18+ Gender: M 108 39.3%; F 167 60.7%. Nationality: Germany Sport: many disciplines	GAD-7: mild anxiety≥ 5; moderate≥ 10; severe≥ 15; PHQ-8: major depression symptoms≥ 10; PHQ-15: cut-off≥ 9 Somatic Symptom Disorder Scale: cut-off ≥ 23; Distress Thermometer 0-10; cut-off ≥ 4	Anxiety: mild 35.6% (F 35.9% M 35.2%), moderate 9.1% (F 12.6%, M 3.7%); severe 2.9% (F 4.0%, M 0.9%) symptoms of major depression 28.6% (F 29.9%, M 26.9%). criteria for SSD-12 + PHQ-15 symptoms of somatic disorder: 6.5% (F 9.0%, M 2.8%) Relevant distress - 95.3% (F 94.0%, M 97.2%). None mental health symptoms 4.7%.		Germany: Anxiety: moderate 3.0%; severe: 1.0-1.2% Depressive symptoms 8.6% Symptoms of somatic symptom disorder, 5-7%	14 (sample*)
Howarth et al[15]	The prevalence of common mental health problems and psychosocial problems in elite swimmers	Cross-sectional, NS	National swimming squad N=36 Age: 18-30 Gender: app. 50:50 Nationality: UK Sport: swimming	The Distress Screener distress≥ 4; PHQ-9: major depressive episode≥ 8, K-10 anxiety / depression≥ 20, Patient Reported Outcomes Measurement Information System: Disturbed sleep: mild≥ 13; moderate≥ 16, severe≥ 20. AUDIT-C: alcohol misuse≥ 3 Smoking YES-NO Adverse nutrition behaviour – 4 questions, Career Satisfaction Scale, career dissatisfaction≥ 10.	Major depressive episode 14.3%. Suicidal ideation expressed 5.7% Distress 14.3% Anxiety/depression 11.4% Adverse alcohol uses 22.9% Disturbed sleep 11.4% Smoker 0% Adverse nutrition behaviour 0%.	Weak positive correlation: between sleep disturbance and depression, and between anxiety/ depression and distress. Moderate positive correlation: between depression and distress.	UK: anxiety and depression in the general population 17-18%; 16-24 years, drinking at increasing and higher risk levels M 32%; F 26%	13 (description of results, conflict of interest - no data*)

Junge et al[21]	Prevalence of symptoms of depression and generalized anxiety disorder	Cross-sectional study, during the season 2015/2016	First and second league players N=187 Age: 20.0±4.7 Gender: F 82 (43.9%) M 105 (56.1%) Nationality: Germany Sport: field hockey	CES-D: mild to moderate depression≥ 16, major depression>21 GAD-7: mild anxiety≥ 5; moderate≥ 10; severe≥ 15	Depression: mild to moderate symptoms 9.1%, severe symptoms 1.6%. Significantly more F; 18.3% than M 4.8% had symptoms of depression ($P < .05$). Moderate symptoms of generalized anxiety disorder in one F (1.2%).	A subjective need for psychological counseling or psychotherapy 3.8%, 2.2% received such treatment.	Germany: The prevalence of depression or of generalized anxiety disorder lower than in the general population of the same gender and similar age	13 (sample, selection*)
King et al[16]	The prevalence of common mental disorders and to test for associations with potential risk factors	Cross-sectional study, NS	Professional athletes N=84 Age: 25.5±6.6, Gender: F 6 7%, M 78 93% Nationality: Ireland Sport: horseracing	Last 2 weeks CES-D: mild to moderate or severe depression≥ 16; GAD-7: moderate or severe≥ 10; K-10: distress≥ 22 AUDIT-C: adverse alcohol use≥ 5, Athlete Burnout Questionnaire, Greenhaus Scale (career satisfaction), the Perceived Available Support in Sport Questionnaire	Adverse alcohol use 61%; depression 35%; generalized anxiety 27%; psychological distress 19%; 33% - had sought help for personal or emotional problems. 79% met the criteria for at least one CMD, 38% for two or more CMDs, and 18% for three or more CMDs.	Significant associations between burnout dimensions and psychological distress and generalized anxiety ($P \leq .05$).		13 (limitations, conflict of interest - no data*)

Lichtenstein et al.[36]	The prevalence of exercise addiction (EA)	Cross-sectional, December 2019 - March 2020	Elite athletes N=417, Gender: F 213 51%. M 204 49% Age: 15-47 Nationality: Denmark Sport: 5 sports	Exercise Addition Inventory, risk of EA ≥ 24; SCOFF: risk of eating disorder ≥ 2	Risk of exercise addiction 7.6% Athletes with risk of exercise addiction – no difference between M and F. Highest risk in the youngest athletes (15–19 years).	Non-significant differences in relation to type of sport: 16% of athletes with high risk of EA with symptoms of an eating disorder compared to 6% of low-risk athletes	Prevalence of EA about 3% in the general exercising population; ranging from 3 to 42% depending on the type of exercise and the used assessment tool.	15
McLoughlin et al.[25]	Lifetime stress as a predictor of depression, anxiety, and well-being	Sequential (two-phase), NS	Elite athletes Phase one N= 95 Age: 29.8±10.9 (18-60) Gender: F 58 61%; M 37 39%; Nationality: USA Sport: many disciplines Phase two 6 participants (5 F, 1 M) 28-36 years old (32.17±3.19) were interviewed.	Stress and Adversity Inventory, PHQ-9: mild depression ≥ 5, moderate≥ 10, moderate/severe≥ 15 severe≥ 20. GAD-7: mild anxiety≥ 5; moderate≥10; severe≥ 15. the Scales of General Well-Being, 'good' well-being> 40.	Depression: severe 1.3%, moderately severe 2.6%, moderate 3.8%, mild 24%. Anxiety: Severe 1.2%, moderate 3.8%, mild 21.8%. No participants met the criteria for both severe depression and anxiety.	Relatively high levels of well-being. Total count and severity of lifetime stressor exposure significantly predicted greater depression and anxiety symptoms, and worse well-being.		13 (selection, conflict of interest - no data*)
Monma et al.[33]	The prevalence and risk factors of poor subjective sleep quality	Cross-sectional, December 2017- January 2018	Elite athletes: N=86 Age: 22.9±3.1 (17-32) Gender: F 41 47.7%; M 45 52.3%. Nationality: Japan Sport: judo	PSQI: poor sleep quality≥ 5; the Competition Stressor Scale; K-6: psychological stress≥ 5	Poor sleep quality 40.7%; PSQI score 5.3±2.1. No sex differences in subjective sleep quality. The presence of psychological distress had a 3.38 odds ratio of causing poor sleep quality compared with the absence of this condition	The prevalence of poor sleep quality was higher in athletes with an athletic career length of 16 years or and with psychological distress.	Japan: Worse sleep latency, sleep duration, and daytime dysfunction than national-level athletes of 36 disciplines (poor sleep quality: 28.0%),	15

Murray et al[35]	Alcohol consumption, harms and behaviours	Cross-sectional April 2019	Elite athletes N=717 Age: M=24, Gender: F 179, 25%; M 538 75% Nationality: Ireland Sport: Gaelic football/ hurling/both	AUDIT-C: adverse alcohol use≥ 5	Current alcohol users 96%; Amongst current drinkers, adverse alcohol use 73%, binge drinking 93%, an alcohol related harm in the past year 65%. Alcohol-related harm in the past year 65%, ≥6 alcohol-related harms in the past year 15%.	Adverse alcohol use positively associated with monthly bingeing, smoking, generally drinking in public, current gambling, an alcohol harm in the past year.		10 (aim, selection, statistics, discussion, limitations*)
Nabhan et al.[27]	Allergies, anxiety, depression, sleep apnoea and sleep quality	Cross-sectional, a retrospective analysis of data of electronic medical records, May – September 2019	Elite athletes N=940 N= 683 Olympic N=257 Paralympic Age NS Gender: F 347 50.8%; M 336 49.2% Nationality: USA Sport: 36 disciplines	the Allergy Questionnaire for Athletes: allergy≥ 5 the Berlin Sleep Apnoea Questionnaire: apnoe≥ 2 PHQ-9: depression ≥10; GAD-2: anxiety≥ 3 PSQI; poor sleep quality≥ 5	37% of Olympic athletes at least one positive screen: Allergy 20.6%; Anxiety 3.1%, Depression 1.9%, Sleep apnoea 3.5% Sleep quality 23.1%	48% of Paralympic athletes training for the Olympics - at least one positive screen. The presence of any positive screen was associated with increased prevalence of other positive screens.	USA general population depression 8–25%, anxiety ~5%	11 (aim, project, sample, selection*)
Neumann et al[17]	The mental health and psychological distress	Cross-sectional study NS	Elite athletes N=32 Gender: M 19 59.4%, K 13 40.6% Age 23.1± 5.8; Nationality: 12 developing nations in the Oceania region Sport: volleyball, athletics, boxing, lawn bowls.	K-10: distress≥ 22, CES-D: depression≥ 16: , GAD-7: anxiety≥ 11 , Social Phobia Inventory: social anxiety≥ 19, SCOFF: eating disorder≥ 2; General Help-Seeking Questionnaire	84% met the cut-off for at least one of the scales; psychological distress 53%; depression 45%; generalised anxiety 22%; eating disorder 61%; social anxiety 41%.			14 (statistics*)

Oevreboe et a[1,2]6	The distribution of mental disorders	Cross-sectional, June - November 2020	Elite athletes Phase 1: N=378 were coded as 'not at-risk' or 'at-risk' regarding symptoms of mental disorders and risk consumption; Phase 2: N=280 (74.1%) at risk; N=106 (45.3%) interviews Age: 26,9±5,6 (19-51) Gender: F 54 50.9% M 52 49.1%, Nationality: Norway Sport: many disciplines	Phase 1 - self-report psychiatric instruments; Hopkins Symptoms Check List HSCL-10 depression and anxiety disorders ≥ 1.85; Bergen Insomnia Scale BIS insomnia last month (days per week) ≥3; EDEQ-S: eating disorders≥ 15; Canadian Problem Gambling Index CPGI, gambling disorder ≥3 3–7 =moderate risk-gambler 8–27= problem gambler AUDIT-C: hazardous drinkers or active alcohol use disorders M ≥4 4–7= increased risk 8–12=high risk F ≥3 3–7= increased risk 8–12=high risk Drug Use Disorders Identification Test DUDIT; Symptoms of substance abuse, harmful use and drug dependence, M≥ 6, F≥ 2 Phase 2 - diagnostic interviews with the athletes with 'at-risk scores' CIDI 5.0 (DSM-5+ICDI-10)	74.1% athletes 'at-risk score' on one or more disorders: affective disorders 34.0%; anxiety disorders 34.0%; OCD and OCD-related disorders 34.0%; Insomnia 61.3%; Eating disorders: 8.5%; Gambling disorder 7.5%; Active alcohol use disorders 77.4% substance abuse, harmful use and drug dependence ≤4.7 37.9% of these athletes completed diagnostic interviews. 44.3% athletes diagnosed with a mental disorder: Sleep problems 24.5% Obsessive-compulsive disorder (OCD) and OCD-related disorders 18.9%, mainly body dysmorphic disorder (BDD. Anxiety disorders (6.6%), Eating disorders (5.7%) Alcohol use disorder (≤4.7%). Only F- eating disorder.	Results from self-report questionnaires did not, in most cases, adequately mirror the number of mental disorders identified using diagnostic interviews		14 (description of results*)

Ojio et al.[14]	The prevalence of mental health problems and suicidal ideation and its risk factors	Cross-sectional study observational study December 2019 - January 2020	Top league athletes N=251 Age:18-36, 51.8% 25-29 years Gender: M 100%, Nationality: Japan Sport: rugby	K-6: depression, anxiety - stress: no distress 0-4, mild 5-10, moderate 10-12, and severe distress 13-24. Suicidal ideation Baron Depression Screener for Athletes, no cut-off scores; Life Events Experienced	32.3% - mild anxiety and depression during the previous 30 days, 4.8% - moderate; 5.2% - severe symptoms, 7.6% - suicidal ideation during the previous 2 week.	Players with mental health problems experienced more stress events in competitions and daily life,		15
Olive et al.[31]	The prevalence and correlates of mental health symptoms	A cross-sectional, July-September 2018	Elite athletes N= 639 non-para; participant, Age: 17+, 23.4±4.7 Gender: F 359 57.1%, M 280 42.9% Nationality: Australia Sport: many disciplines	GHQ-28, K-10; Rosenberg Self Esteem Scale; Warwick-Edinburgh Mental Wellbeing Scale, Problem Gambling Severity Index (PGSI), Male Depression Risk Scale (MDRS), EDEQ, AUDIT, Satisfaction with Life Scale	GHQ-28, caseness: total 34.5%, M 24.7%, F 40.1% Hazardous alcohol consumption: total 15.7%, M 20.6% F 12.2% No problem gambling: Total 67.5% M 58.1% F 89.2% Quality of life: 'good' and 'very good' categories: Total 81.0%, M 85.5%, F 77.7%; EDE-Q 'high' body weight dissatisfaction: total 25.8%, M 16.3%, F 33.3% EDE-Q 'high' body shape dissatisfaction: total 26.2%, M 23.1%, F 39.7%	Para-athletes -significantly lower total scores on the AUDIT (P< .001), lower levels of alcohol consumption. Para-athletes - higher scores on the GHQ-28 subscale for severe depression (P= .022).		15

Perry et al[28]	The prevalence of, and factors associated with depression, anxiety, and eating disorder symptoms	Cross-sectional November 2020 - March 2021	Elite athletes N=115 Age: 25.1±4.5 (18-34) Gender: F (100%) Nationality: England Sport: football	PHQ-9:, mild (5–9), moderate (10–14) , severe (15–19); GAD-7: mild (5–9) moderate (10–14) severe ≥15; BEDA-Q: ≥ 4 disordered eating symptoms, General Help-Seeking Questionnaire	Eating disorder symptoms 36% Currently trying to lose weight - 35% Anxiety symptoms: mild 28%, moderate 11%, severe 0% Depression: mild 26.5%, moderate 10.2%, severe 1.0%	Diagnosed: mental illness 14%; Mental health diagnosis: Depression & anxiety 26%, anxiety 20%, depression 4%, ADHD 20%, eating disorder 4%		15
Poucher et al.[23]	The prevalence of symptoms of mental health disorders (depression, anxiety, and eating disorders)	Cross-sectional, December 2019	Elite athletes, national team N=186 Age: M=26 Gender: M 73 39.2%, F 113 60.8% Nationality: Canada Sport: many disciplines	PSS, Athletes' Received Support Questionnaire, The Athletic Coping Skills Inventory, The Rosenberg Self-Esteem Scale, CESD-R, GAD-7, EAT-26	31.7% symptoms of depression, 18.8% symptoms of moderate (12.9%) to severe (5.9%) general anxiety, 8.6% high risk of an ED. 41.4% one or more mental disorders: only depression symptoms 17.2%, only GAD 6.5%, only ED 3.2%, Depression + GAD + ED 3.2%, Depression + GAD 9.1%, Depression + ED 2.2% GAD + ED 0%	13.9% - previously diagnosed with a mental disorder. Stress was a statistically significant correlate of depression, anxiety, and EDs	The general Canadian population the lifetime prevalence of GAD 8.7%, the 12-month prevalence 2.6% The lifetime prevalence of a major depressive episode 11.3%, 12-month prevalence 4.7%, the 12-month prevalence of eating disorders .5%, and the prevalence of eating attitude problems 1.5%	15

Purcell et al[30]	The prevalence and correlates of mental health symptoms	Cross-sectional, July – September 2018	Highest level athletes N=749 Age: 17+ 24.6±6,9, Gender: M 393 52.5%; F 356 47.5%; Nationality: Australia Sport: 37 sports	GHQ-28; K-10; the Rosenberg Self-Esteem Scale, Problem Gambling Severity Index (PGSI); Male Depression Risk Scale; EDEQ; AUDIT; Satisfaction with Life Scale	'high to very high' psychological distress 17.7%, the threshold for 'probable caseness' 35%. Risky alcohol consumption 15.3%, no problem gambling 94.0%, body dissatisfaction 19.5%. Ever treated for a mental health or psychological problem 22.4%.	Athletes significantly more likely to report 'high to very high' psychological distress and to meet the threshold for 'probable caseness'. Athletes reported significantly lower rates of risky alcohol consumption, problem gambling and body dissatisfaction.	'high to very high' psychological distress 9.5%, the threshold for 'probable caseness' 19%. risky alcohol consumption 24%, no problem gambling 64.3%, body dissatisfaction 24.4%	15
Ravi et al[32]	The prevalence of self-reported restrictive eating, current or past eating disorder, and menstrual dysfunction	Cross-sectional, May - August 2020	Elite athletes N=846 Age: 15-45 Gender: F 100% Nationality: Finland Sport: 67 sports	the Low Energy Availability in Females Questionnaire, Female Athlete Triad screening questionnaire,	Self-reported restrictive eating 25%, eating disorders 18%.	Higher rates of lean sport athletes compared with non-lean sport athletes, no differences between elite and non-elite athletes.	Self-reported eating disorder in a Finnish female community based sample 17.9%	15
Ueda et al[40]	Risk of alcohol related disorders	Nationwide cohort study, 1924 – 2020	Top football players N=6007 General population N=56168 Age: NS Gender: M 100% Nationality: Sweden Sport: football	Alcohol related disorders (diagnoses recorded in death certificates, during hospital admissions and outpatient visits, or use of prescription drugs for alcohol addiction); disorders related to misuse of other drugs	Diagnoses of alcohol related disorders: 4.3% football players, disorders related to other drug misuse .5%. The hazard ratio lowest at around age 35 years, and then increased with age.	Risk of alcohol related disorders lower among football players than among men from the general population.	General male population; diagnoses of alcohol related disorders: 6.3% disorders related to other drug misuse: 2.6%	15

Vorster et al[34]	The specific deficits in sleep health with respect to well-being	Cross-sectional, after the COVID-19 pandemic	Elite athletes N = 1004 Gender: F 540, 53.8%; M 464, 46.2%, Age: 16-65 Nationality: Switzerland Sport: 88 sports	the Sleep Difficulty Score from the Athlete Sleep Screening Questionnaire: clinical sleep problem: none (0-4), mild (5-7), moderate (8-10), and severe (11-17).	Moderate or severe level of clinical sleep problem 19% (none: 37.4%, mild: 43.6%, moderate: 15.1%, severe: 3.9%). problems falling asleep within 30 min 17.3% , severe onset problems (over 60 min) 3%, F more prone (*P*< .05). Difficulty maintaining sleep more than three times a week 18%, F more likely (P< .001).	Athletes slept on average 7–8 h, with no gender difference. 5.5% used sleeping pills more than once a week. F more than twice as likely to take sleeping aids (7.8% vs. 2.7%; *P*< .001).		15
Walton et al[37]	Gender differences in the reporting of, and contributors to, mental health symptoms	Cross-sectional, NS	Elite athletes N=523 Age: 18+, M 24.5±8.4; F 23.8±6.3 Gender: F 292 56%, M 231 44%. Nationality: Australia Sport: many disciplines	GHQ-28, K-10, Rosenberg Self-Esteem Scale, Warwick-Edinburgh Mental Well Being Scale, the weight and shape subscales from the EDEQ, Alcohol Use Disorders Test, Satisfaction with Life Scale.	GHQ: caseness M 29.0%, F 34.6%, (*P*= .017). No differences in psychological distress. F more adverse life experiences in total (*P*= .01).	No differences in the likelihood of seeking help from those around them, M more satisfaction with the support they received (*P*< .001).		14 (sample*)

For this reason, a modified version of the Appraisal Tool for Cross Sectional Studies (AXIS tool) was used[13]. This tool consists of 20 questions: one question concerns the introduction, 10 questions refer to the methods, 5 - the way of presenting the results, the next two - discussion, the last - conflict of interests/ funding and the consent of the ethics committee. In order to adapt the tool to the specificity of research on the prevalence of mental disorders in athletes, 5 questions were removed. Table 1 presents the number of positive answers to the questions. In the case of a negative assessment, it was indicated which issues it concerned. Fourteen (50%) studies received the maximum score, which indicates high methodological quality. In three cases (10.7%), the quality of the study was insufficient (10 - 11 points), in the remaining eleven studies (39.3%) – sufficient (13-14 points). The most common deficiencies concerned the method of recruitment to the study, the size and representativeness of the sample. There was no information about the method of sample selecting or data that would allow determining the representativeness of the sample. It was not always clearly indicated what was used to determine statistical significance. Information about conflicts of interest was not always provided.

Distress

The presentation of data on the prevalence of stress among elite athletes is facilitated by the fact that most studies have used *the Kessler Psychological Distress Scale* with similar cut-off points. Nevertheless, the prevalence of stress varies. The lowest prevalence of moderate to severe stress (10%; n=25) was found in a study of 251 Japanese male rugby players[14]. In other studies of athletes of both genders conducted in European countries and Australia, the percentages ranged from 14.3% (4/36 British swimmers)[15] to 19.0% (16/84 Irish jockeys)[16]. In summary, it can be estimated that 10-20% of high-level athletes experience at least moderate distress. There is no data on gender differences in the incidence of stress. A significantly higher prevalence of psychological distress (53%; 17/32) was found in the Oceania study[17], which is likely due to cultural differences.

A high prevalence of stress of at least moderate intensity (40.9%; 9/22) was also found in Spanish female wrestlers[18] using the *DASS-21*. Since this scale has not been used to assess stress in other studies, there is no point of reference for these results.

The results of a study of 275 German athletes of various disciplines using the *Distress Thermometer*[19] suggest that over 95% of the respondents disclosed relevant distress. This large discrepancy from other studies is probably due to differences in the tools used to measure stress.

The data obtained using the *Athlete Psychological Strain Questionnaire* in a longitudinal study of 74 Australian female soccer players[20] may be disturbing. The percentage of women at high risk of sports-related distress ranged from 52.9% to 64.9%.

Anxiety

Only some articles provide data on the prevalence of anxiety disorders of varying severity. In such a case, we report data on at least moderate levels of anxiety. Because the rates varied by gender, we present data separately for women and men, where possible. It should be noted that we have more data for women (from seven articles) than for men (from three articles). In women, the prevalence rates of moderate anxiety ranged from 1.2% (one of 82 German field hockey players)[21] to 16.8% (33 of 196 Swedish female athletes from various disciplines)[22]. None of the German field hockey players[21] showed moderate anxiety disorders, the frequency of moderate anxiety was the highest (6.6%, n=8) in the group of 137 Swedish male athletes of various disciplines[22]. Severe anxiety disorders were reported in a smaller percentage of athletes. In women, rates ranged from 1.0% (one of 113 Canadian female athletes in various disciplines)[23] to 8.5% (two of 24 female canoeists in Spain[24]). In men, prevalence rates ranged from .9% (one of 108 athletes from various disciplines in Germany)[19] to 2.2% (n=3) of Swedish athletes[22]. In all of these studies, the *GAD-7* was used to measure anxiety. In a study of 22 female wrestlers in Spain[18], four (18.2%) of the competitors were found to have very severe anxiety. However, this was measured using the *DASS-21*. Very severe anxiety disorders were not reported in the men.

In some studies, the results were not analysed according to gender and/or only the percentage of athletes exceeding the cut-off point for anxiety disorders (usually moderate) was reported without specifying the level of severity. The total prevalence rates of moderate and severe anxiety disorders ranged from 5.3% (5/95 American athletes of various disciplines using the *GAD-7*)[25] to 34.1% (129/378 Norwegian athletes of various disciplines studied with the *HSCL-10*[26]. In women, these cumulative prevalence rates ranged from 12.4% (n=14/113 Canadian female athletes in various disciplines[23] to 25.0% (6/24 Spanish elite female paddlers[24]; and in men from 4.6% (5/108 German elite athletes)[19] to 8.8% (12/137 Swedish male athletes of various disciplines)[22].

The results seem fairly consistent when we consider only studies using *GAD* conducted in larger groups of athletes. Prevalence rates of generalized anxiety are higher in women than in men, regardless of the level of severity. Moderate to severe generalized anxiety occurs in 5-9% of male athletes and 12-25% of female athletes.

Depression

Depression prevalence rates are more difficult to compare because of the greater variability in the instruments used and the cutoff points used. In studies using the *CES-D*, the percentages presented are for moderate to severe depression. The lowest rate (10.7%, n=20) was recorded in the group of 187 German field hockey players[21], and it was significantly higher in women (18.3%) than in men (4.8%). The highest prevalence of depression (43.7%, n=14) was found among 32 athletes of various disciplines from the Oceania region[17].

Oevreboe et al.[26] found that 34.1% (129/378) of Norwegian athletes were at risk of affective disorders based on the *HSCL-10* results. Researchers using the *PHQ-9* reported the percentage of depression moderate to extremely severe. The percentage of athletes with depression was lowest (1.9%, n=13) in a study of 683 American athletes from 36 sports[27]. An almost tenfold higher rate (18.3%, n=60) was recorded among 333 Swedish athletes[22]. It was significantly higher in women (26%, n=51) than in men (7.3%, n=10). A similar prevalence of moderate to extremely severe depression (22.7%) was found in a study of 22 Spanish female wrestling players[18] using the *DASS-21*. These percentages are, however, twice as high as the data on depression in women in other studies using the *PHQ-9*[20,28]. In the case of depression, the results are therefore more diverse, depending not only on cultural factors, but also on the measurement tool. In all studies in which such comparisons were made[19,21,22], a higher incidence of depression was shown in female athletes than in male athletes.

Eating disorders

The prevalence rates of eating disorders vary depending on gender and the research tool used. In studies using the *EAT-26*, results indicating a high risk of eating disorders were found in several to a dozen or so percent of athletes. The lowest rate (8.6%, n=16) was recorded among 186 Canadian athletes of both sexes practicing various sports[23]. Abbot et al.[29] found a

high risk of eating disorders in 15% of male (20/134) and 11% (8/73) female soccer players. Similar results (14.9%, n=7) were obtained in a study of 47 female canoeists from Spain[24]. Against this background, the percentage of Spanish female wrestlers at risk of eating disorders (9/22) is surprisingly high (40.9%)[18].

Researchers using the *EDEQ* in groups of athletes of both genders found:

1. eating disorders in 8.5% (n=32) of 378 Norwegian athletes[26],
2. high body weight dissatisfaction in 19.5% (n=146) of 749 Australian athletes[30],
3. high body shape dissatisfaction in 26.3% (n=168) and high body weight dissatisfaction in 25.8% (n=165) of 639 Australian Olympians[31]; rates were significantly higher in women (39.7% and 33.3%) than in men (23.1% and 16.3%).

Disordered eating symptoms tested using *BEDA-Q* occurred in 36% (41/115) of English female soccer players[28] and from 14.8% (11/74) to 18.9% (14/74) of Australian female soccer players[20].

Self-reported restrictive eating was found in 25% (212/846) of Finnish female athletes of various sports disciplines and eating disorders in 18% (152/846) of these athletes[32]. It should be clearly emphasized, however, that this study was based on the declarations of the respondents and not on the results of questionnaires.

Sleep disorders

Poor sleep quality assessed by *PSQI* was found in 23.1% of American Olympians of both genders (158/683)[27] and in as many as about 40% of Japanese female and male judokas, regardless of gender (35/86)[33]. A study using the *ASSQ* revealed a clinical sleep problem in 18.9% (190/1004) of over a thousand Swiss athletes[34]. Problems with falling asleep within 30 minutes concerned 17.2% (n=173) of these athletes, while severe onset problems occurred in 3% of respondents (n=30), significantly more often in women than in men. The difficulty in maintaining sleep more than three times a week occurred in 18% (n=181) of Swiss athletes, also significantly more often in women[34]. Moderate sleep disturbances were diagnosed in 24.3% to 32.4% (18-24/74) of Australian female soccer players[20]. Based on the data presented above, it can be assumed that at least a dozen or so percent of athletes have sleep problems, and these difficulties occur more often in women.

Misuse of alcohol

Although all studies used the *AUDIT-C* to assess adverse alcohol use, the prevalence of alcohol problems varies considerably. Based on the risk/adverse alcohol consumption scale, it was found in:

1. 15.3% of Australian athletes (115/749)[30] and 15.7% of Australian Olympians (100/639)[31], with rates higher in men (20.6%) than women (12.2%) in the latter study[31];
2. 25.8% of Swedish athletes (86/333)[22], with rates higher in men (27.7%) than women (24.5%) and 22.2% (8/36) of British swimmers[15];
3. 41.5% to 48.6% of 74 Australian female soccer players[20];
4. 77.5% (293/378) of Norwegian athletes of both sexes[26], 72.9% of Irish Gaelic football and hurling players (523/717)[35] and 60.7% (51/84) of Irish jockeys, mostly men[16].

Other mental problems

One study of 417 Danish athletes of both sexes[36] addressed exercise addiction. The risk of addiction was found in 7.6% of respondents, with no differences according to sex. Data on gambling problems come from two Australian studies, in one of which the prevalence of problem gambling was found to be 10.8% in women and 41.9% in men[31], in the other the rate was 6%[30]. Gambling disorder was diagnosed in 7.5% of Norwegian athletes[26].

Cumulative prevalence and comorbidity of mental disorders

Some of the reviewed articles provided information on the cumulative prevalence and comorbidity rates of mental disorders. Among athletes from the Oceania region (n=32), 84% met the cut-off for at least one of the scales measuring psychological distress, depression, generalized anxiety, eating disorder and social anxiety[17]. Almost 80% of Irish jockeys met the criteria for at least one common mental disorder (CMDs – depression, anxiety, distress, adverse alcohol use), 38% for two or more CMDs, and 18% for three or more CMDs[16]. Almost three-quarters of 378 Norwegian athletes from various disciplines had an 'at-risk score' on one or more disorders: affective disorders, anxiety disorders, obsessive-compulsive disorder, insomnia, eating disorders, gambling disorder, active alcohol use disorders[26]. Seventy seven of 186 Canadian athletes (41.4%) met the criteria for at least one disorder (depression, general anxiety, eating disorders)[23]. 37% of 683 USA Olympic athletes had at least one positive screen for anxiety, depression, sleep apnoea, poor sleep quality and allergy[27].

More than a third of the 749 Australian athletes passed the threshold of GHQ-28 for 'probable cosiness' of common mental disorders[30]. The results of another study of 523 elite athletes, also conducted in Australia, indicate that significantly more women (34.6%) than men (29,0%) exceed this threshold[37]. In a subsequent study of 639 Australian athletes, 35.5% of respondents were above this threshold, with the rate being significantly higher in women (40.1%) than in men (24.7%)[31].

In the group of 275 German athletes, only 4.7% had nonmental health symptoms[19].

Psychiatric diagnoses

The reviewed articles also provide information on the frequency of psychiatric diagnoses.

Of the 333 Swedish athletes, 8.1% (10.7% women and 4.4% men) received a professional psychiatric diagnosis, 29.6% of them had received more than one diagnosis[22]. Point prevalence of mental health problems was 11.7%, lifetime prevalence was 51.7%, in both cases, the percentages were significantly higher among women. Most common were depressive disorders, eating disorders or trauma and stress related disorders[22].

Diagnosis of a mental health disorder (agoraphobia, generalized anxiety disorder, alcohol dependence, bulimia nervosa) was received by 26.2% of the 54 football players from Villarreal Club de Fútbol, 24.1% had received psychiatric treatment[38].

Of the 106 Norwegian athletes who qualified for a psychiatric diagnosis based on the results of the screening questionnaires, 44.3% were diagnosed with mental disorders: sleep problems, obsessive-compulsive disorder, anxiety disorders, eating disorders, alcohol use disorder; 76.6% were diagnosed with one mental disorder, 23.4% had 2 or 3 mental disorders[26]. A psychiatric diagnosis was received by 14% of the 115 British female footballers (most frequently depression and anxiety, anxiety, depression, ADHD, eating disorder[28].

13.9% of 186 Canadian national team players were diagnosed with a mental disorder: depression, generalized anxiety, eating disorder, addiction, attention deficit disorder, bipolar disorder, post-traumatic stress disorder, obsessive compulsive disorder[23].

22.4% of 749 highest level athletes in Australia were ever treated for a mental health or psychological problem[30].

A retrospective analysis of mental disorders diagnosed in Swedish athletes undergoing psychiatric treatment indicates that the most common were: anxiety disorders (69%), affective disorders (51%), panic disorders (31%), eating disorders (26%), stress-related disorders (25%), disorders due to psychoactive substance (6%). Two-thirds of patients were diagnosed with

more than one disorder[39].
Between 1924 and 2020, 4.3% football players in Sweden received diagnoses of alcohol related disorders[40].

Mental disorders of athletes compared to the general population

Some articles contain information on the frequency of mental disorders in the general population or the samples of non-athletes, which allows for a direct comparison of results, or in the discussion the authors describe the data compared to the general population. Detailed information on this topic is presented in the Table 2. The signs ↓ and ↑ indicate cases in which the results of athletes are lower or higher than the data for the general population.

Athletes have been found to have higher rates of anxiety[18,20,22,23], depression[15,19,20,27], eating disorders[18,23], distress[18,20] and alcohol misuse[20] than the general population. Only one study found a lower rate of anxiety/depression and adverse alcohol use among 36 members of the UK national swimming team than the general population[15]. However, differences in research methodology make it difficult to draw correct conclusions from these comparisons. For this reason, the Australian study, which compared the results of over 700 athletes with population norms of the scales used or with the results of demographically

Table 2. Comparison of research results between athletes and the general population

Country, study group	Prevalence	Prevalence in general population
Sweden[22], elite athletes, n=333	Moderate and severe: Depression 18.3% Anxiety 16.8%↑ 19.5% reached the moderate clinical cut-offs for symptoms of anxiety and/or depression	Clinical level: Depression 17.2% Anxiety 10.8%
Sweden[39], elite athletes - patients at psychiatric clinics	7% of elite athletes had at least one contact with specialised psychiatric care in 2020↑	5.2% of Swedes had at least one contact with specialised psychiatric care in 2020
Australia[20], women soccer players, n=74	Moderate anxiety 5.7-9.2%↑ Moderate depression 5.4-10%↑ Alcohol misuse 41.5-48.6%↑ Substance misuse 0-3.1% Sport-related psychological distress 52.9-64.9%↑	Anxiety/ depression 4%, Alcohol misuse 2%, Drug misuse 0.5%. Psychological distress in the working population 5-18%
Spain[38], Villarreal Club de Fútbol (CF) soccer team, n=54	Diagnosis of a mental health disorder (MHD) 26.2% Mental health treatment 24.1% Psycho-active drugs 7.4%↓ Self-harm 2.1%.	MHD 29%, Mental health treatment 26.2% Psycho-active drugs 18.1% Self-harm 2.7%
Spain[18], female wrestling athletes, n=22	Mild – severe: Depressive symptoms 50% Anxiety symptoms 59.1% Stress symptoms 54.5% At risk: Eating disorders 40.9% Driven for thinness 46% Bulimia 22%, Body dissatisfaction 33.8%	Scores were clearly higher than those of a similar age and gender in the general population
Germany[19], elite athletes, n=275	Anxiety: moderate 9.1%; severe 2.9%↑ Symptoms of major depression 28.6%↑ Symptoms of somatic disorder: 6.5%	Anxiety: moderate 3.0%; severe: 1.0- 1.2% Depressive symptoms 8.6% Symptoms of somatic disorder, 5.0-7.0%
United Kingdom[15], national swimming squad, n=36	Anxiety/depression 11.4%↓ Adverse alcohol use 22.9%↓	Anxiety/depression 17-18% Adverse alcohol use M 32%; F 26%
Germany[21], field hockey players, n=187	Depression (mild – moderate) 10.7% Anxiety (moderate) 0.5%	The prevalence of depression or of generalized anxiety disorder lower than in the general population of the same gender and similar age
Canada[23], elite athletes, n=186	Anxiety 18.8%↑ Depression 31.7%↑ High risk of eating disorders 8.6%↑	Anxiety: the lifetime prevalence - 8.7%, the 12-month prevalence - 2.6% Major depressive episode: the lifetime prevalence 11.3%, the 12-month prevalence - 4.7% Eating disorders: the 12-month prevalence .5%

Australia[30], highest level athletes, n=749	'High to very high' psychological distress 17.7%↑ The threshold for 'probable cosiness' 35%↑ Risky alcohol consumption 15.3%↓ No problem gambling 94%↑ Body dissatisfaction 19.5%↓	'High to very high' psychological distress 9.5% The threshold for 'probable caseness' 19% Risky alcohol consumption 24% No problem gambling 64.3% Body dissatisfaction 24.4%
Finland[32], elite female athletes, n=846	Self-reported restrictive eating 25%↑ Eating disorders 18%	Self-reported eating disorder in a Finnish female community-based sample 17.9%
Sweden[40], elite male football players, n=6007	Diagnoses of: Alcohol related disorders 4.3%↓ Disorders related to other drug misuse .5%↓	Diagnoses of: Alcohol related disorders 6.3% Disorders related to other drug misuse 2.6%

appropriate community control samples, deserves special attention[30]. Athletes were more likely to have high psychological distress and exceed the threshold for 'probable caseness' of mental disorders, while having lower prevalence of gambling problems, risky alcohol consumption and body dissatisfaction. The prevalence of alcohol and other substance use disorders was also found to be lower in a cohort of Swedish football players than in the adult Swedish male population[40].

Discussion

The reviewed studies differ in their methodological design, both in terms of the individuals studied and the methods used. They included a very wide range of participants, from 22 Spanish female wrestlers[18] to 1004 Swiss athletes[34]. Ten studies had fewer than 100 athletes (mean 62.4); also 10 studies had sample sizes ranging from 100 to 500 (mean 257). More than 500 athletes (523–1004) participated in 7 studies (mean 774), three of which were conducted in Australia. Unique in terms of its size is the analysis of the prevalence of alcohol use disorders in a national cohort of 6007 Swedish top football players from 1924 to 2020[40].

The study groups also differed in their degree of homogeneity and representativeness for the population of athletes in general or for athletes of a specific sport. An extreme case is the study of 54 football players from the Villarreal Club de Fútbol[38]. At the other end of the spectrum, we find a study of over a thousand Swiss athletes practicing 88 different sports[34] or 846 Finnish athletes from 67 sports[32]. The largest group of athletes in one sport were 251 Japanese judokas[33].

The reviewed articles most often presented the results of questionnaires commonly used in scientific research with satisfactory psychometric properties (e.g. *GAD-7*, *PHQ-9*, *K-10*, *DASS-21*, *EAT-26*, *EDEQ*, *PSQI*, *AUDIT-C*, *GHQ-28*). We treat such data as more accurate and reliable indicators of the prevalence of mental disorders.

The results of studies of large groups of athletes from many different disciplines using questionnaires that meet psychometric requirements are undoubtedly a more accurate indices of the prevalence of mental disorders than data from a small group of athletes from one discipline, especially those studied using questionnaires of questionable psychometric quality. For this reason, the discussion will focus on the first type of studies. The results of the second type of studies will be cited to indicate potential variables differentiating the data obtained in the review.

The results of the current review suggest that the prevalence of distress in both male and female athletes, especially based on K-10 scores from over 700 Australian athletes from 37 sports[30], is approximately 17%, which is similar to the percentage (19%) obtained in the meta-analysis by Gouttebarge et al.[2]. Similar rates were noted in British swimmers[15] and Irish jockeys[16].

The percentages were almost half as high in Japanese rugby players[14], which may be due to the sport they practiced, cultural factors, or the fact that all the participants were male. Rugby is a contact sport with a high risk of injury. The results of the studies indicate that players of such sports may experience increased stress resistance over time due to both physiological and psychological mechanisms[41]. It may also be the result of natural and performance-driven selection[42]. However, it cannot be ruled out that cultural factors are partly responsible for this difference. Low prevalence rates of mental disorders have been reported in high-income countries of Northeast and Southeast Asia[1].

In all studies in this review that included only women[18,20], the prevalence of psychological distress was higher than in studies of both male and female athletes. This is also confirmed by the results of previous reviews[43,44.] The hypothesis that the prevalence of distress in athletes may vary depending on cultural factors seems to be supported by the results of athletes from developing countries in Oceania, more than half of whom experience distress[17]. The results of studies conducted during the pandemic also confirm cultural differences in athletes' stress levels[45]. It is also important to note that diagnostic systems that are based on Western conceptions of mental illness may be less accurate in diagnosing people from different cultural backgrounds[9].

The extremely high percentage of relevant distress among 275 German athletes of both sexes is probably due to low validity of measurement tool (*Distress Thermomether*). It is difficult to clearly explain why over 40% of Spanish female wrestlers obtained results indicating at least moderate stress[18]. This may be due to a different measurement tool (*DASS-21*) or specificity of a very small sample.

The information contained in the reviewed articles on stress provides little opportunity to compare its prevalence in athletes with that of the nationwide prevalence. The exception is that the percentage of Australian female soccer players at high risk of sport-related distress is more than five times higher than the percentage of working Australians experiencing psychological distress[20]. However, these data are not fully comparable.

The prevalence of moderate to severe generalized anxiety, measured by GAD-7, in athletes of both sexes can be estimated at about 16%. It ranged from 12% to 18.8% in groups of over a hundred athletes of various disciplines[19,22,23]. Unfortunately, it is difficult to compare this percentage with the data obtained by Gouttebarge et al[2], as they analyzed the combined occurrence of anxiety/depression, establishing the prevalence of both disorders at 33.6%. The prevalence of anxiety in these numerous multisport groups was significantly higher in women (16.6-22.4%) than in men (4.6-8.8%). Similar data were obtained in studies of both athletes[44]. and the general population[1]. Identifying as female was associated with increased anxiety in seven articles covered in the latest review of research on anxiety, depression and stress among female student-athletes[43].

The results of small groups of athletes of one discipline differed significantly from the above data. They were both higher (27% of Irish jocks of both sexes[16]; 32% of female Spanish paddlers[24],

and lower (5.7-9.2% of Australian female footballers[20]), than those observed in larger and heterogeneous groups. This is probably due to the specificity of the studied groups, which is the effect of both natural and performance-driven selection and many years of sports training. It is possible that the same factors were responsible for the fact that moderate symptoms of generalized anxiety disorder were observed only in one female field hockey athlete out of less than 200 German first and second league players[21]. This issue requires further research. In turn, the significantly higher prevalence of anxiety in Norwegian athletes[26] (34%) may be the result of using a different research tool (*HSCL-10*).

Exceptionally low percentages were found in studies of American athletes of various disciplines, both examined using the GAD-2[27] (3.1%,) and the GAD-7[25] (5%). It can be assumed that they are mainly due to cultural differences. It is possible that the model of the athlete-warrior present in American culture plays a certain role here. It is also known that American athletes, especially at the elite level, have been included in psychological preparation programs for many decades. Shaping the ability to cope with stress, developing mental resilience may result in a reduction in the frequency of mental problems[46].

The meta-analysis conducted by Steel et al.[1] suggests that the rates of common mental disorders in developed non-European English-speaking countries are similar to those revealed in studies conducted in Europe (19% vs. 17.1%), but firstly – they concern all mental disorders, diagnosed on the basis of psychiatric interviews, and secondly – in the general population. In the reviewed articles, we found no data on cross-cultural differences in the frequency of mental disorders in athletes. It is worth making this problem the subject of comparative research in the future.

The prevalence of anxiety disorders among athletes was higher than that of non-athletes or population norms in studies conducted in Sweden[22], Australia[20], and Canada[23] and in German athletes across a range of disciplines[19]. The rates were lower in German field hockey players[21] and members of the British swimming team[15]. These rates are difficult to extrapolate to the meta-analysis by Gouttebarge et al.[2] because they found a combined prevalence of anxiety and depression (33.6%).

Estimating the prevalence of depression in athletes based on the data obtained in this review is difficult due to the variability not only of the measurement scales but also of the cut-off points used. The results of a study of relatively large groups of European athletes practicing various sports using the PHQ-9 indicate that the percentage of people with at least moderate depression is on average around 25% and ranges from 18.3%[22] (Sweden) to 28.6%[19] (Germany). It is higher in women (approximately 28%) than in men (approximately 17%), which has been observed both in the general population[1,6] and in previous studies of athletes[47,48]. A recent meta-analysis of studies on the mental health of female student-athletes found that identifying as female, specifically a female student-athlete, was one of the leading reported determinants for increased depression, anxiety, and stress[43].

The resulting pooled prevalence rate of anxiety and depression estimated from this review (41%) is higher than the meta-analysis by Gouttebarge et al.[2], which showed that 33.6% of elite athletes reported anxiety/depression symptoms but is not significantly different from the upper limit of the confidence interval (95% CI: 27.4 to 39.7). It is worth recalling here that the meta-analysis included articles published from inception to November 2018. In recent decades, there has been a trend of increasing incidence of mental disorders, especially in young adults (18–34 years old)[6], which also seems to be illustrated by the results of this comparison.

Lower rates of depression were found in smaller groups of single-discipline athletes: British swimmers[15] and British[23] and Australian[20] female footballers, which is probably due to the previously indicated factors of natural and consequential selection as well as changes occurring as a result of many years of training.

Similarly to anxiety, the lowest, several percent incidence of depression was found in American athletes of various disciplines[25,27]. The prevalence of depression was slightly higher (15.1%) in a study of over 200 American collegiate athletes of both sexes, but still lower than the rates reported in studies of European elite athletes, suggesting that we are dealing with cultural differences here[49.] The above-mentioned social stereotypes and the effectiveness of the athletes' mental preparation process may also play a role[46].

Also, studies using *CES-D* on small homogeneous groups provide very diverse results (10% of German field hockey players[18] and 35% of Irish jockeys[19]. In interpreting these results, one can refer to a study of over 600 American collegiate athletes of various disciplines, in which using the same cut-off point, the risk of depression was found in 22.3% of the subjects[49.] In the remaining cases, other measurement scales were used, which makes comparisons impossible.

Studies of numerous groups of athletes of various disciplines of both sexes suggest that the prevalence of eating disorders is approximately 8% to 13%[26,28], and the prevalence of body and/or appearance dissatisfaction is twice as high[23,30].

The reviewed articles provide more data for women than for men. Rates range from 11% to 19% in female athletes from a variety of disciplines[32], including soccer[20,28] and canoeing[24], suggesting that between one and two in ten elite-level female athletes are at risk of developing an eating disorder. Conversely, rates of up to 40% have been reported in Spanish female wrestlers using the EAT-26[18] and English female soccer players using the BEDA-Q[28]. In the first case, the high rate may result from improper eating behaviors caused by the need to maintain a certain weight category. In the second case, the sports discipline practiced cannot be referred to, because in the group of Australian female footballers studied with the same tool, the rate was twice as low[20]. The issue of differences in the frequency of eating disorders in women from different countries requires further research to determine the significance of socio-cultural factors, especially the beauty patterns of the female.

The prevalence of eating disorders and body dissatisfaction has been generally higher in women than in men[32], which is consistent with data from the general population[51]. The exception to this is the results from British football players[29], where no gender differences were found. Previous studies have found lower rates of eating disorders and lower rates of body dissatisfaction in women participating in male-dominated sports than in other sports, particularly in aesthetic, gravitational and weight-class sports[51,52].

The effects of comparing the results of the study of athletes with data from the general population or people who do not practice sports are interesting. Eating disorder symptoms, such as drive for thinness and body dissatisfaction were found in 17% of Swedish gymnasts of both sexes[53]. Commenting on these data, the authors write that 38% of Swedish University students reported at least mild concern with their shape, which is higher than in their study of gymnasts[53]. The incidence of body dissatisfaction in the large group of Australian athletes was also lower than in the general population (19.5% and 24.4%, respectively)[30].

In the Canadian population, the 12-month prevalence of eating

disorders is .5%, and the prevalence of eating attitude problems is 1.5%, and a high risk of eating disorders was found in 8.6% of members of the Canadian national teams[23], suggesting that athletes are at greater risk of eating disorders.

In contrast, rates of eating disorders were higher in British football players than in a non-athlete control group, and the reverse was observed in women[29]. It should be noted, however, that the control group was small and thus may not have been representative of the general population. Finally, in Finland, the prevalence of eating disorders was the same (18%) among over 800 athletes from various disciplines as in the general female population[32]. Higher rates were observed among lean sport athletes compared with non-lean sport athletes, which is consistent with the results of previous studies[53].

It is very difficult to generalize the prevalence of eating disorders in athletes based on the data included in the current review because of differences in the methods used and the sports disciplines and ethnicity of the respondents. Also in the meta-analysis by Gouttebarge et al.[2], the prevalence of eating disorders or adverse eating habits varied widely (1-28%). Differences in study populations and methodologies are likely to explain the discrepancies between studies in both reviews.

The results of studies of numerous groups of athletes of many disciplines allow us to estimate that the prevalence of sleep disorders ranges from 19%[33] to 24%[26] of athletes, which means that on average every fifth athlete, more often women than men[33], has trouble sleeping. This is a slightly lower rate than in the meta-analysis Gouttebarge et al.[2], where the prevalence of sleep disorders symptoms was 26.4%. Studies of the general population have also found higher rates of sleep disorders in women than in men, especially in adolescence[55,56].

When it comes to the prevalence of adverse alcohol use, the data collected using the same AUDIT-C scale vary greatly depending on the sample studied. In Australian athletes it is 15%[30,31], in Swedish athletes – 25%[22], in Norwegians – 77.5%[26], to stay with studies of numerous multi-sport groups. The percentages are higher in women than in men[22,31], as in the general population[57,58]. Particularly high rates have been noted in Irish football and hurling players[31] and jockeys[13] as well as Australian female soccer players[20]. Gouttebarge et al.[2] reported that 18.8% (95% CI: 11.1 to 26.5) of elite athletes reveal alcohol abuse symptoms, emphasizing high heterogeneity between studies. This wide range of rates may be due to cultural differences in alcohol consumption patterns and acceptance of alcohol abuse. Further research is needed on this topic. Interesting data are provided by the analysis of risk of alcohol related disorders in a nationwide male cohort study (1924–2020) in Sweden[40]. The risk of alcohol related disorders was lower among football players (4.3%) than among men from the general population (6.3). The same relationship was found for disorders related to other drug misuse (.5% and 2.6%, respectively). Risky alcohol consumption was found to be more common in the relevant general population than in Australian athletes[30] and in the British swimming national squad[15]. These data suggest that, regardless of nationality, the prevalence of alcohol misuse is higher in the general population than in elite athletes.

The problem of gambling and exercise addiction has been analysed in too few studies to allow for drawing conclusions regarding the prevalence of these problems in athletes.

The cumulative prevalence of mental disorders among elite athletes is particularly disturbing. Even when we limit ourselves to studies of relatively large multi-sport groups, the criteria for at least one disorder are met by over 74% of Norwegian athletes[26], 41% of elite athletes in Canada[23], and 37% of US athletes[27]. The percentage is even higher among German athletes (95.3%), but it is determined by the exceptionally high frequency of distress determined using an imprecise scale[19].

Another way to assess the prevalence of mental health problems is to measure the percentage of athletes who score above the threshold for "probable caseness" on the GHQ-28. In two large groups of Australian athletes[31,37], this percentage exceeded 30% and was significantly higher in women (35-40%) than in men (25-29%). In the general Australian population, this percentage is lower at 19%[34]. Based on an earlier review of 32 studies published to January Armino et al.[59] report that the prevalence of symptoms of anxiety/depression assessed by the short version of the questionnaire (GHQ-12) ranged from 21-48%. The Australian data fall within this range. The incidence of symptoms of anxiety/depression ranged from 17-57%[59].

The above-mentioned information on the frequency of mental disorders in athletes comes almost entirely from self-report questionnaires. Based on the comparison of their results with the results of psychiatric diagnosis, Oevreboe et al.[26] concluded that results from self-report questionnaires did not, in most cases, adequately mirror the number of mental disorders identified using diagnostic interviews. However, data on the frequency of psychiatric diagnoses of mental disorders are not reassuring. A psychiatric diagnosis was received by 12%[22] (Sweden) to 22%[30] (Australia) of high-level athletes, and in a large proportion of cases it included more than one disorder[26,38]. The most common were anxiety, depression, and eating disorders, while disorders related to the abuse of alcohol and other psychoactive substances were diagnosed less frequently[22,23,26,28,40]. More than 20% of athletes received psychiatric treatment[29,38]. These rates were often higher than in the general population[22,39].

At this point, it is worth noting a study whose results indicate an even greater scale of the problem. This is a study of 32 elite athletes from 12 developing nations in the Oceania region representing such sports as volleyball, athletics, boxing and lawn bowls[17]. Athletes were nominated to participate in the program by each nation's leading sport organization based on performance rankings or standings. 84% of them met the cut-off for at least one of mental problems: 53% - psychological distress; 45% - depression 45%; 22% - generalized anxiety, 61% - eating disorder and 41% - social anxiety. The authors conclude that mental health symptoms are prevalent among elite athletes from developing nations in the Oceania region and they call for more mental health screening to be performed in the interest of providing equitable conditions for athletes[17].

The actions taken by the International Olympic Committee, which led to the IOC consensus statement on mental health in elite athletes, can be considered as an anticipatory response to this call and to the results of earlier systematic reviews and meta-analyses indicating a high prevalence of mental disorders among athletes[4].

The greatest difficulty in generalizing the results of the current review results from the multitude of research tools used in the studies. They included both commonly used scales with good psychometric properties and tools with questionable validity and unknown reliability, tools dedicated to athletes and those used in the general population, typical screening scales assessing the risk of mental disorders and clinical methods allowing their diagnosis. Even in the same scales, different cut-off points were used. All this makes data from different studies very difficult to compare.

This problem was also noted by the IOC expert panel. One of the main recommendations formulated by this team was the need for appropriate screening of competitive athletes for mental health

symptoms and disorders. To implement this, the IOC established a Working Group on Mental Health, the aim of which was, among others, to develop a tool that would enable early identification of competitive athletes potentially at risk of developing mental health symptoms and disorders. This led to the development of *The Sport Mental Health Assessment Tool 1* (*SMHAT-1*)[3]. A three-step procedure has been established that allows for early identification of those athletes in need of mental health treatment. In the first step, an initial triage is performed based on the results of the *Athlete Psychological Strain Questionnaire* (*APSQ*), which measures athlete distress. In the event of a result indicating an elevated or high risk for psychological distress athletes proceed to step 2. and are assessed on six disorder-specific screening questionnaires:

- *General Anxiety Disorder-7* (*GAD-7*): the symptoms of anxiety.
- *Patient Health Questionnaire-9* (*PHQ-9*): the symptoms of depression.
- *Athlete Sleep Screening Questionnaire* (*ASSQ*): the presence of sleep disturbance.
- *Alcohol Use Disorders Identification Test Consumption* (*AUDIT-C*): the presence of alcohol misuse.
- *Cutting Down, Annoyance by Criticism, Guilty Feeling, and Eye-openers Adapted to Include Drugs* (*CAGE-AID*): the presence of substance misuse.
- *Brief Eating Disorder in Athletes Questionnaire* (*BEDA-Q*): the presence of disordered eating.

If all screening questionnaires are negative, brief intervention and monitoring takes place in step 3a. If one or more screening questionnaires are at or above the threshold, in step 3b a comprehensive clinical assessment is conducted by a sport medicine physician and/or mental health professional (e.g. psychiatrist and clinical psychologist).

In the last two years, the first reports of the results of the *SMHAT-1* study of athletes have appeared. We deliberately did not include them in the review, wanting to use them as a reference point for our results. *SMHAT-1* was used, among others, in Canada in 542 university-level student athletes from 17 sports[60]. Participants reported mental health symptoms with prevalence of 24% to 40% for distress, 15% to 30% for anxiety, 19% to 26% for depression, 23% to 39% for sleep disturbance, 49% to 55% for alcohol misuse, 5% to 10% for substance use, and 72% to 83% for disordered eating. Female athletes were more likely to suffer psychological strain, depression, and sleep disturbance; male athletes were more likely to report substance use. These data are largely consistent with the results of the current review. A similar study was conducted in the USA by Anderson et al.[61]. It covered 1066 athletes from 51 different Olympic and Paralympic and Summer and Winter sports. 29.5% of athletes screened positively on the *APSQ*. Once again, we observe a significantly lower prevalence of mental disorders among American athletes than among athletes of other nationalities. A possible explanation may be the stronger stigmatization of people with mental problems in American society or the greater mental toughness and resilience of this group of athletes[62]. The percentage of false negative results in the *APSQ* among athletes who obtained a positive result in the second step (confirming the occurrence of symptoms) ranged from 4.8% (*PHQ-9*) to 66.7% (*BEDA-Q*). According to the authors, it is therefore likely that the presence of potential mental health concerns in the Mountjoy et al[60] study may be underestimated. They recommend that all *SMHAT-1* questionnaires be used in parallel with the *APSQ*, rather than using the *APSQ* as a screening test.

In turn, in a study conducted in Japan in a group of 220 rugby players, it was found that 65% of players experienced the sport-related psychological distress[33]. However, the prevalence rates of mental disorders were significantly lower than in the studies included in the current review: anxiety (2.7%), depression (5.9%), sleep disturbance (20.9%), alcohol misuse (72.3%), substance misuse (4.6%) and disordered eating (36.8%). It seems that this is due to cultural differences and the specificity of the sport practiced. The authors conclude that Japanese version of *SMHAT-1* Step1 might be effective to detect anxiety, depression, and suicidal ideation in population of rugby players.

SMHAT-1 has also been used in 1121 elite Polish athletes (545 female, 576 male) before the 2024 Paris Olympic Games[64]. 72.4% of athletes scored above the triage threshold for psychological distress. This is more than twice as high as in the aforementioned study of American elite Olympic athletes[61] and in Canadian collegiate athletes (24.3–39.6%)[60]. 51% of Polish elite athletes were positively screened in at least one of the *SMHAT-1* questionnaires. Specifically, 6.9% screened positively for anxiety symptoms, 8.2% for depressive symptoms, 3% for suicidal ideation, 4.2% for drugs misuse, 19.8% for alcohol misuse, 19.9% for sleep disturbances, and 22% for disordered eating. These rates are in close alignment with the results from Team USA[61] and two to three times lower than in many reports covered by this review. The authors[64] indicate possible differences in the study procedure as the reasons, which in Polish conditions was not anonymous, which could have caused less willingness to disclose mental health symptoms[65]. The cultural differences mentioned earlier in the discussion are also important. Female athletes were also more frequently screened positively in triage, anxiety and depressive symptoms, disordered eating and sleeping disturbances, no significant differences were found for drugs and alcohol misuse. These data are also consistent with the results of the current review.

At this point, let us return to the role of cultural differences in the presentation, diagnosis and treatment of mental disorders in athletes. The use of screening and diagnostic tools that are not fully culturally appropriate may reduce the validity of the results of studies of athletes from ethnic groups other than people from Europe and North America. Culture influences understandings of mental health and illness, treatments, and health-promoting behaviors. Culture modifies the ways we cope with everyday problems and more extreme stressors. Not only are there cultural differences in the types of stressors people experience, but their appraisals also differ, as do the choices of how to respond to stressors[66]. Adopting different cut-off points based on the results of local studies is only a partial solution to the problem. Although mental disorders such as depression and anxiety are common in all regions of the world, the clinical presentation varies across settings. This may be due to cross-cultural differences in the somatization of symptoms and the expression of emotional distress. For example, in sub-Saharan Africa, distress is more often expressed through somatic symptoms and local idioms. There is concern that the use of instruments developed for populations in high-income, English-speaking countries may misdiagnose disorders in athletes from other cultures[67].

The best example is the previously discussed results of the study of elite athletes from the Oceania region[17]. It can be assumed that similar difficulties would appear in the study of athletes from Africa. Unfortunately, none of the studies included in the review concerned athletes from this continent. This is an additional limitation of the review, allowing the formulation of an important postulate to expand the cultural scope of future studies.

Practical Applications

The results of the current review confirm the data from previous meta-analyses indicating that athletes are at risk of mental problems and disorders to a similar extent as their peers who do not participate in sports. Their coaches should be aware of this risk and watch out for the first symptoms. They should be reported to mental health specialists as early as possible. Athletes, especially at the turn of adolescence and young adulthood, should be screened for mental problems using valid and reliable psychological tools. The *SMHAT-1* seems to be an interesting proposition here, but requires further studies to confirm its psychometric properties in different populations of athletes. It is worth remembering that it consists of scales that take into account symptoms of mental disorders typical of Western culture.

The results of the current review particularly emphasize the importance of cultural validity of screening and diagnostic tools. It is essential to use scales that have undergone a complete process of cultural adaptation. Simply translating them into the local language is absolutely insufficient, and all members of the coaching staff should bear this in mind.

Coaches should be aware that only fully qualified professionals authorized to use diagnostic tools can properly assess the mental health of athletes.

Psychologists and psychotherapists working with athletes should be reminded that basing diagnosis on screening scales can lead to misdiagnosis. It is worth quoting the authors of the Polish adaptation of SMHAT-1: "SMHAT-1 proved a useful addition to the medical check-ups for elite athletes as a basis for a subsequent brief clinical intake interview. Used in this way, SMHAT-1 has an additional benefit of elevating mental health literacy and helps in normalizing conversations about mental health"[63].

Athletes who are exposed to many stressors related to training and competition should be provided with psychological support. In the case of more serious mental problems, constant care by mental health specialists is necessary.

Conclusions

The results of the current review allow us to draw the following conclusions:

1. The prevalence of mental disorders among elite athletes is at least as high as in the general population.
2. The prevalence rates of mental disorders determined from studies conducted between 2016 and 2022, the results of which were published between 2020 and 2024, do not differ significantly from those determined in earlier reviews.
3. The prevalence of most disorders included in the reviewed studies is higher in women than in men.
4. The prevalence of mental disorders appears to vary depending on cultural factors and may vary depending on the sport practiced.
5. The use of different diagnostic tools and the adoption of different cut-off points makes it difficult to compare results, which is why the development of SMHAT-1 seems promising. Consistent use of this tool in the study of athletes' mental problems will increase the chance of formulating more precise conclusions regarding the factors determining their mental health. It will also allow for early identification of athletes requiring both short-term psychological support and therapy.

Acknowledgments

Not applicable.

Informed Consent Statement

Not applicable.

Ethical Committee approval

Not applicable.

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Topic

Sport Psychology

Conflicts of interest

The authors have no conflicts of interest to declare.

Funding

No funding was received for this investigation.

Author-s contribution

Conceptualization M.G.; methodology: M.G.; software M.G.; validation M.G.; formal analysis M.G.; investigation M.G.; resources M.G.; data curation M.G.; writing – original draft preparation M.G.; writing – review and editing M.G.; visualization: M.G.; supervision M.G.; project administration M.D. Author has read and agreed to the published version of the manuscript.

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Received: 23.10.2024.
Accepted: 08.05.2025.
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