SPYCHALSKI, Jan and SPYCHALSKA, Maria. Depression in Athletes: From Etiology to Intervention. Quality in Sport. 2025;38:58254. eISSN 2450-3118.
https://doi.org/10.12775/QS.2025.38.58254
https://apcz.umk.pl/QS/article/view/58254

The journal has been 20 points in the Ministry of Higher Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Higher Education and Science of 05.01.2024. No. 32553.
Has a Journal's Unique Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 r. Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398.
Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 26.01.2025. Revised: 17.02.2025. Accepted: 18.02.2025 Published: 18.02.2025.

Depression in Athletes: From Etiology to Intervention

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Abstract

Introduction: Depression is the leading cause of ill health and disability worldwide. It's affecting approximately 280 million people across the globe with the highest rate between 20 and 40. It's estimated that women are diagnosed twice as many times as men. Ethology is complex and multifactorial including genetic, psychological, social, endocrine, and immune factors, which results in abnormal biochemical changes and incorrect neurotransmission in the brain. Recent data points that physical activity reduces the risk of depression and its associated symptoms regardless of age or geographical location.

Aim of the study: The aim of this study is to analyze the available literature to examine the prevalence of depression among athletes and the unique risk factors contributing to it.

Materials and methods: Comprehensive review of the literature available on PubMed, Google Scholar, Scopus database by searching the keywords "depression", "depressive disorder", "physical activity", "sport", "athletes ".

Results and conclusion: Athletes are just as susceptible to depression as the general population. However, many athletes hide their symptoms and do not seek help due to stigma,

fears of career repercussions and concerns about being perceived as weak. Regular screening for early signs of depression and providing access to specialized psychological support during critical stages of their careers could significantly improve depression detection and facilitate timely intervention. Destigmatizing mental health problems in the sports community is crucial to solve detection, treatment and prevention problems of depression in athletes.

Keywords: depression, depressive disorder, physical activity, sport, athletes

I. Introduction

Depression is one of the most common mental disorder. It's the top ten leading causes of burden, with no evidence of global decrease since almost 30 years. It's the primary cause of disability worldwide. It is characterized by a constant low mood and associated cognitive disturbances related to self-perception and the interpretation of the world. These symptoms can be accompanied by painful feelings, panic attacks, impaired humor, varying levels of anhedonia, and disruptions in circadian rhythms and motivational drives. In its most severe manifestations, depression may also present with psychotic symptoms [1,2].

Etiopathogenesis of depression is complex and multi-factor. The key role plays genetic, social, psychological components and those associated with endocrine and immune systems. These irregularities lead to abnormal biochemical changes and incorrect neurotransmission in the brain[3,4]

Sources differ as to how many cases of depression are present in current society, but it is estimated to affect approximately 280 million people globally. The calculated disability-adjusted life years (DALYs) account for over 47 million life years lost [5]. Depression plays a key role in shortening lifespan, either as an associated condition with other illnesses or through suicide [6]. Most studies show that the dominant prevalence of depression occurs between the ages of 20 and 40. Women are diagnosed with depression twice as often as men, which may be a consequence of their greater willingness to seek professional help. Seasonal affective disorder occurs more frequently among women. The most up-to-date data show that due to COVID-19 pandemic the frequency of depression and anxiety has increased [7]. Overall the epidemiological studies of depression indicate that

approximately 20% of women and 10% of men will experience depressive episodes over their lifetime [8,9,10].

Cohort studies indicate that physical activity is strongly associated with a reduced probability of developing depression. Current data from meta-analysis reported an adjusted odds ratio of 0.83 (95% CI: 0.79–0.88, I2=0.00) for people who regularly do physical activity. This protective effect of physical exercises against depression is present across all age groups, including adolescents, adults, and seniors. Furthermore, it is uniform across all geographical regions, with odds ratios ranging from 0.65 to 0.84 [11]. Other comprehensive meta-analysis containing data from 111 reports, involving over 3 million adults from 11 countries across five continents, revealed that sport plays a key role in protection against developing depression or experiencing an increase in subclinical depressive symptoms. These manifestations of depression were significantly lower in both adjusted (OR: 0.79, 95% CI: 0.75–0.82, I2=87.6) and unadjusted analyses (OR: 0.69, 95% CI: 0.63–0.75, I2=93.7). Additionally, it has been shown that moderate or intensive physical activity was associated with significantly lower prevalence of depression and severity of symptoms compared to light physical activity (physical activity was measured by public health guidelines) [12].

II. Susceptibility to Depression Among Athletes and Its Risk Factors

Based on studies revealing the positive impact of physical exercise on depressive disorders, one might assume that athletes are immune to depression. Conversely, this is not the case. Research presents varying findings: one study reported that the prevalence of depression among collegiate athletes ranges between 15.6% and 21% [13]. However, this study included only male participants. Other data, this time encompassing female subjects, indicate a depression prevalence of 21%, with a higher occurrence of this disorder observed among women [14]. Another research compared the incidence of depression in athletes to the general population. The findings were as follows: among men, depressive symptoms were observed in 3.7–26.7% of athletes, compared to 7.6–34.4% in non-athletes. Among women, the prevalence was 9.8–36.5% for athletes and 6.1–42.5% for non-athletes [15]. In another study, which also included a control group of non-athletes, it was found that 33.5% of athletes experienced depression, although their symptoms were less severe than those in the control

group [16]. Furthermore, women were shown to report depressive symptoms up to twice as often as men [15], aligning with trends observed in the general population.

The conclusion is clear: athletes are also vulnerable to depression. However, they face an additional challenge, as, in addition to the general risk factors affecting the population at large, athletes encounter unique predisposing factors. These include pressure exerted by coaches and teammates, failure to meet performance expectations, and fear of career-ending injuries. Collegiate athletes often struggle to balance their athletic careers with academic responsibilities and social life [17]. A large review study conducted among female athletes, based on an analysis of over 2,400 articles, identified additional factors influencing susceptibility to depression. These include health-related elements such as sleep quality, diet, and substance use. Social support, defined as positive feedback from coaches, strong team relationships, and support from family and friends, also played a significant role in alleviating depressive symptoms. Susceptibility to depression varied by sport—track and field athletes exhibited the highest prevalence (35.4%), while lacrosse players showed the lowest (13.5%) [18]. Team sport athletes were found to have a threefold lower risk of depression compared to individual competitors [19]. Seasonal variation in depressive symptoms was also observed, with lower prevalence during off-season periods, likely related to health factors and infections [20]. Another influential factor was training intensity. Studies indicated that depressive symptoms tended to decrease during peak training periods [21], whereas overtraining exacerbated symptoms, which normalized once training frequency was reduced [22].

Most studies have been conducted on collegiate athletes, but it is also worth examining the prevalence of depression among sports professionals. They are even more exposed to stressors such as intense training, dealing with injuries, and, in certain sports like artistic gymnastics, body image issues [23]. The 2020 HBO documentary *The Weight of Gold* focused specifically on this issue. Michael Phelps, a multiple Olympic medalist and world champion, shared his feelings after the conclusion of the Olympic Games, describing those emotions as "traumatic emptiness." According to Phelps, at least 80% of Olympians experience depression after their competitions. Similar encounters were confirmed by other athletes featured in the documentary. It turns out that life achievements such as participating in the Olympic Games do not necessarily bring happiness. On the contrary, after years of exhausting training, during which sport becomes the sole purpose of life, the culmination of

this effort with a medal is not the realization of dreams but rather a path to depressive disorders [24].

III. The onset of depression following injuries

Few professions are as susceptible to diverse injuries as athletes. Beyond the physical inconveniences, injuries among athletes carry a distinctly economic significance—they result in temporary or prolonged exclusion from training, leading to a loss of income and the potential collapse of a career. A severe injury can permanently preclude an individual from engaging in any form of athletic activity, which, for those who envision their future in sports, is a catastrophic outcome. It is therefore unsurprising that athletes experience fear of injuries that could momentarily exclude them from the sporting realm. Moreover, those who have the misfortune of sustaining an injury often experience its impact not only physically but also psychologically.

Research indicates that injuries are directly associated with depressive disorders in athletes. One of the earliest studies [25] was conducted on 916 football players from the National Collegiate Athletic Association (NCAA) Division 1. The study compared athletes who had experienced injuries with those who had not, measuring their symptoms using the CES-D depression scale. The prevalence of depression (as well as life stress) was significantly higher among injured individuals. Additionally, both groups showed a relatively high risk of depression (33% with injury, 27% without). Another study [26] reported that as many as 51% of athletes who sustained injuries exhibited depressive symptoms ranging from mild to severe. It is worth noting that this study was conducted on elite-level athletes, where the consequences of injuries posed a significant threat to their careers. Further research [27] explored the occurrence of depression following injuries, including a subsequent evaluation of symptoms one month after the event. Depressive manifestations typically appeared approximately one week after the injury. However, follow-up assessments conducted a month later revealed no significant differences in the severity of symptoms between injured athletes and the control group.

Among injuries sustained by athletes, concussions deserve particular attention. A concussion occurs when mechanical force causes a rapid acceleration and deceleration within the skull, leading to rotational or translational movement of the brain inside the cranium. These unnatural brain movements result in microdamage to neurons and blood vessels, leading to

functional impairments and metabolic dysfunctions. Symptoms usually last from a few days to several weeks but may persist and develop into post-concussion syndrome [28]. The exact mechanisms linking depression and concussions remain difficult to determine due to their diffuse and nonspecific nature. However, changes in global neuronal activity have been captured using EEG studies. Specific alterations in the alpha wave band have been observed in both depression and concussions [29]. The functional connectivity of the brain—defined as electrical activity between different brain regions—was found to be significantly less organized in athletes with a history of concussions compared to a control group [30]. Moreover, it has been noted that changes in the alpha band intensify with each successive injury and persist even after the symptoms subside [31]. In depression, EEG studies have long focused on alpha wave asymmetry, and symptom severity, as measured by the Beck Depression Inventory, correlates with the extent of EEG changes [32]. For individuals suffering from both depression and concussion, studies have revealed significantly more disrupted wave patterns compared to those experiencing only one condition [30]. Although substantial evidence indicates that similar wave disturbances occur in depressive disorders and concussions, the precise meaning of these changes and their specific impact on both conditions remain unclear [29]. The relationship between these disorders was also studied using diffusion tensor imaging (DTI) scans in National Football League athletes with a history of concussions. The research further demonstrated that players diagnosed with depression exhibited specific changes in the forceps minor, including alterations in fiber density, axonal diameter, and myelination in white matter, which were not observed in the control group [33].

The likelihood of a depression diagnosis increases with the number of concussions sustained. Athletes who experienced three or more concussions were three times more likely to develop depression compared to those who had never suffered a concussion [34]. Although the precise mechanisms linking these two conditions remain unclear, protecting athletes from the adverse effects of injuries is a challenge that must be addressed.

IV. The end of a career as a triggering factor for a depressive episode

The end of one's professional career and transition to retirement is a significant event for each of us; however, for athletes, it often entails a dramatic change in lifestyle, for which they are frequently unprepared. For professional competitors, career termination—whether planned or unplanned—means the loss of income, commissions, and sponsorships, and often

occurs without any further plans for how to manage life without such support. In some cases, however, an athlete's career may end abruptly and unexpectedly—such as through an injury that prevents further competition or expulsion from the team. This type of retirement scenario has a more significant negative impact on the sportsperson's health [35].

Career closure can be associated with the onset of depression, anxiety, substance abuse, sleep disturbances, and eating disorders [36]. Depressive disorders are most prevalent in individuals who have recently retired, typically within 15 years of the end of their career [37]. However, studies show that depressive symptoms related to involuntary retirement tend to decrease over time as individuals adapt to their new circumstances [38]. A major issue is the fact that among retired athletes, the suicide rate is 2-4 times higher than in the general male population [39], which further highlights the burdensome nature of this period. It is also important to emphasize that after retirement, athletes are usually deprived of sources of support, management, and contact with health professionals, which were privileges during their active careers [40]. This situation complicates the search for and access to appropriate assistance.

In this context, it is important to mention athletic identity, which is determined as the degree to which an athlete defines themselves in terms of their athletic role [41]. It is one of the key factors predicting the onset of depression during the retirement transition. Athletes who rate themselves highly on this scale may experience difficulties in adapting to a situation where they lose their connection to their athletic identity [42]. Athletic identity is often stronger in men, making them more susceptible to depressive and adaptive disorders than women in the pre-retirement period [43].

The numbers are unforgiving. Around 70% of retired basketball players reported a loss of identity (both personal and social) [44]. This is a very high percentage and represents a significant challenge for healthcare systems targeted at these individuals. To illustrate the strength of athletic identity, we can refer to a statement made by Michael Phelps in the aforementioned documentary: "Who was I outside of the swimming pool? None of us had normal childhoods. I'm just a swimmer. Not a human being. Not a person" [24]. It is no surprise that athletes, deprived of the world they know, experience feelings of helplessness, loss of purpose, and emptiness. Another individual who fell victim to this trend was Brittany George, an Australian skier. After a back injury forced her into retirement, she also exhibited similar experiences to those of Phelps. "It has literally been my whole life, I've been 'the

athlete' from when I was 2 until when I was 20 or 21," she said. "I did not have an identity. I was labelled 'the athlete' from a very young age and just rode with it" [45]. She committed suicide in January 2022.

Researchers agree that a strong athletic identity is the source of many psychological problems when a career ends [46]. Providing retired athletes with specialized care in the first years after career termination would allow for better management of symptoms and prevent the catastrophic consequences of depression.

V. Discussion

Analyzing the evidence, it is clear that athletes are just as susceptible to depression as the general population. Moreover, there is a high likelihood that the statistics presented in the above studies are incomplete. Many athletes hide their symptoms and do not seek help due to fears of mental health stigma, potential negative career consequences, and being perceived as weak or unreliable [15]. In addition to the daily stressors that affect everyone, athletes face unique challenges specific to their professional activities. These factors can significantly impact their mental well-being. Therefore, it is essential to focus more attention on supporting the psychological health of athletes. Regular screening for early signs of depression and providing access to specialized psychological support during critical stages of their careers could significantly improve depression detection and facilitate timely interventions.

Individuals who have direct contact with athletes, such as coaches, sponsors, personal physicians, or other trusted collaborators, should play a central role in this process. Their involvement can improve communication and help identify problems more effectively. It is also crucial to provide these individuals with training to raise their awareness of mental health issues and increase their confidence in discussing these topics. An important component of supporting athletes' mental health is implementing preventive measures, such as stress management training, fostering strong team relationships, and educating about mental health. These initiatives should be implemented early in an athlete's career and intensified during critical periods, such as after an injury or during rehabilitation. Athletes

who experience trauma should receive immediate psychological support, with ongoing monitoring of their mental state throughout the recovery process. Psychiatric care is equally vital for athletes at the end of their careers. Each individual in this situation should undergo a mental health assessment and have guaranteed access to psychiatric treatment when needed, both in the pre-retirement period and during the first years of retirement. Consultant support can be particularly valuable in preventing depression in this group by offering guidance on alternative career paths, identifying new sources of income, and helping athletes redirect their skills into other areas of life. However, the most important action remains the destigmatization of depression, both in the sports community and in society at large. Depression should not be seen as a sign of weakness but rather as a condition that requires support and treatment. Normalizing the perception of depression will increase the number of individuals reporting symptoms, enabling appropriate assistance to be provided. Such efforts can yield significant benefits by improving mental health among athletes.

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All authors have read and agreed with the published version of the manuscript.

Disclosure:

No disclosures.

Funding statement:
This research did not receive special funding.

Institutional Review Board Statement
Not applicable.

Informed Consent Statement
Not applicable

Data availability statement
Not applicable.

Conflict of Interests Statement
The authors declare no conflict of interest.

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