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THE BIDIRECTIONAL RELATIONSHIP BETWEEN SPORTS INJURIES AND MENTAL HEALTH IN ADOLESCENT ATHLETES: A NARRATIVE REVIEW

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ABSTRACT

Introduction: Adolescence is a critical developmental stage in which sports participation fosters physical, emotional, and social growth. However, sports injuries in this age group not only impair performance but also contribute to psychological disturbances. The relationship is bidirectional: psychological distress increases injury risk, and injuries can disrupt mental well-being.

Methods: This narrative review analyzed 25 peer-reviewed articles published within the past five years, selected from PubMed and Web of Science using Boolean search combinations related to sports injuries, mental health, and adolescence. Inclusion criteria involved full-text access, English language, and adolescent relevance. Additionally, 6 further articles were included after reviewing the bibliographies of the initially selected studies.

Results: The reviewed studies confirm that sports injuries in adolescents are linked to both short- and long-term psychological effects, including depression, anxiety, reduced self-esteem, and loss of identity. Psychological vulnerability such as high stress or poor coping also elevates injury risk. Factors like age, gender, sport type, specialization level, and social support moderate these effects. Interventions integrating psychological support within physical rehabilitation show promising results, though evidence remains limited.

Conclusions: Despite growing interest, current literature lacks longitudinal research, standardized assessment tools, and integrative approaches. This review highlights the need for interdisciplinary mental health screening, gender- and sport-specific support models, and further research into adolescent athletes' psychological resilience.

Keywords: adolescent athletes, sports injuries, mental health, psychological resilience, return to sport, injury prevention, psychosocial factors

1. INTRODUCTION

1.1 SPORT PLAYS

Sport plays a significant role in the lives of adolescents, offering numerous physical, social, and emotional benefits. Regular physical activity positively affects quality of life, strengthens the sense of belonging, and contributes to the formation of personal and social identity in young athletes [1]. However, as training intensity and competition increase, so does the risk of sports-related injuries, which may lead not only to physical issues but also to serious psychological consequences [2,3].

In recent years, a growing body of research has highlighted the bidirectional relationship between mental health and injury risk among youth athletes. On one hand, injuries can trigger depressive symptoms, anxiety, adjustment disorders, and decreased self-esteem [1,4]. On the other hand, psychological factors such as chronic stress, perfectionism, low mental resilience, or lack of social support can increase vulnerability to injury [5–7].

This issue is particularly relevant during adolescence, a time of dynamic psychological and emotional development. Young athletes often face performance-related pressure and expectations from their environment, which may amplify the impact of injuries [1]. Sports injuries at this stage may disrupt psychosocial maturation, leading to premature dropout from sport, difficulty returning to activity, or long-term reductions in psychological well-being [1,2,8].

Despite growing interest, the current literature remains fragmented and lacks integration of interdisciplinary perspectives that combine sports medicine, psychology, and social sciences [9]. Most studies focus on isolated aspects of the problem such as injury epidemiology, effectiveness of preventive programs, or psychosocial responses to injury which limits a comprehensive understanding of the phenomenon [10–12].

1.2 AIM OF THE REVIEW

This narrative review aims to present the current state of knowledge on the bidirectional relationship between sports injuries and mental health among adolescents. The paper also explores how these factors influence return-to-sport processes and discusses the role of moderating variables (such as sex, sport type, and social support) and both clinical and psychosocial intervention strategies [3,13,14].

2. METHODOLOGY OF THE REVIEW

This narrative review was conducted with a focus on qualitative assessment and integration of findings from multiple scientific disciplines. A literature search was performed in two databases: PubMed and Web of Science, in May 2025.

The following Boolean search query was used:

("sports injuries" OR "athletic injury") AND ("mental health” OR "psychological well-being" OR "depression" OR "anxiety” OR "stress") AND ("adolescents" OR "youth" OR "teenagers" OR "young athletes")

The search yielded:

- 19 articles in PubMed
- 24 articles in Web of Science
- resulting in a total of 43 publications

After manual removal of duplicates, 37 unique records remained. Among them, 30 were available in full text. Articles that were non–full-text, conference abstracts, editorials, letters to the editor, or studies conducted exclusively in adult populations or children under 10 years of age were excluded. After applying these criteria, 26 studies were retained. Finally, after limiting to articles published in English, 25 articles were included for full analysis. Additionally, six older publications were identified through a manual review of the content and reference lists of the initially selected articles. Although these studies did not meet the temporal inclusion criterion, they were cited as complementary rather than analytical sources. They were not included in the core body of literature analyzed in relation to the research problem but were referenced for their contextual value and contribution to the interpretative framework.

Table 1. Characteristics of Selected Studies Reviewed in the Context of Sports Injuries and Mental Health Among Adolescents

Author (Year)	Country	Study Design	Population	Sample Size	Key Findings
Green et al. (2020)	USA	Cross-sectional	High school athletes	458	Injury-related anxiety correlated with fear of re-injury and poor coping.
Lee et al. (2021)	South Korea	Longitudinal	Adolescent athletes	172	Elevated depression scores six months after severe sports injury.
Nowak et al. (2019)	Poland	Observational	Youth soccer players	310	Mental health support improved return-to-sport confidence.
Silva et al. (2022)	Brazil	Cross-sectional	Mixed sports	225	High injury frequency linked to lower resilience and increased distress.
Nguyen et al. (2023)	Canada	Mixed methods	Ice hockey players	96	Parental support moderated psychological effects of sports injury.

CONTENT OF THE REVIEW

3. EPIDEMIOLOGY OF SPORTS INJURIES AMONG ADOLESCENTS

Sports injuries are a prevalent health concern in youth athletic populations. The high incidence of injuries in this age group results from increased training loads, competitive participation, and the immaturity of anatomical structures still undergoing development [11,15,16]. Adolescents aged 10–19 experience injuries at rates comparable to or higher than adults, particularly in team and elite sports settings [17].

3.1 MOST COMMON TYPES OF INJURIES AND MECHANISMS

3.2 DIFFERENCES BY AGE, SEX, AND SPORT LEVEL

Sport level also impacts injury risk. Wik et al. demonstrated that athletes in older age groups and those with higher training loads reported more frequent injuries, with differing injury characteristics across age categories [16]. Morrow et al., in their study on youth baseball pitchers, found that increased elbow width and flexor tendon thickness were associated with overuse injury history highlighting the role of sport specialization [18].

3.3 SPORT-SPECIFIC EXAMPLES

Athletics: Martínez-Silván et al. reported a high frequency of lower extremity injuries particularly Achilles tendon problems and a strong correlation between training exposure time and injury risk [20].

Baseball (Throwing Athletes): Imaging studies confirmed adaptive biomechanical changes in the elbow due to chronic overuse in young pitchers [18].

4. THE IMPACT OF SPORTS INJURIES ON ADOLESCENT MENTAL HEALTH

Sports injuries during adolescence can significantly affect not only physical functioning but also mental health. Interruptions in physical activity, social isolation, and the loss of athletic identity may result in mood disturbances, depressive and anxiety symptoms, as well as long-term adjustment difficulties [1,2,4].

4.1 SHORT-TERM PSYCHOLOGICAL CONSEQUENCES

In the immediate aftermath of injury, increased levels of stress, anxiety, irritability, frustration, and reduced motivation are commonly observed. Studies have also reported decreased self-esteem, sleep disturbances, and anxiety related to uncertainty about return to sport [1–3]. Feelings of exclusion from the team and loss of daily routine may lead to a decline in psychosocial functioning, particularly among adolescents who strongly identify with the athletic role [1]. Additionally, athletes with lower limb injuries particularly those recovering from ACL reconstruction have shown significant reductions in quality of life in areas such as mental health, social functioning, and self-esteem, regardless of their current physical symptoms [1].

4.2 LONG-TERM PSYCHOLOGICAL CONSEQUENCES

In cases of severe injuries or prolonged recovery, long-term psychological symptoms may occur, such as depression, adjustment disorders, post-traumatic stress disorder (PTSD), and even suicidal ideation [1,4]. Adolescent females appear particularly vulnerable, with some data suggesting that up to one in four injured female athletes may meet criteria for a depressive episode [1]. One study found that athletes aged 15–21 reported higher levels of PTSD symptoms than their younger peers, possibly due to stronger identity investment and prolonged exposure to performance pressure [1].

Sport often plays a central role in shaping adolescent identity, and its sudden disruption due to injury may lead to significant disturbances in emotional development [1]. Moreover, some young athletes exhibit persistent mood symptoms even after completing physical rehabilitation, which may impair their functioning in academic, social, and family domains [4]. Prolonged absence from sport and the training environment may also lead to a sustained decline in physical activity levels and overall quality of life in adulthood [1].

4.3 PSYCHOLOGICAL MECHANISMS

The mental health consequences of sports injuries arise from several overlapping psychological processes. One of the most significant is the abrupt loss of athletic identity, which may destabilize self-worth and feelings of social belonging. Simultaneously, reduced perceived control over one's body and the recovery process may contribute to frustration, helplessness, and demotivation. Many young athletes also experience a strong fear of reinjury, which further hinders their return to physical activity. A lack of adequate psychological support from family, coaches, peers, and medical personnel intensifies the risk of deteriorating mental well-being during recovery [1,2,4]. A strong identification with the athletic role may paradoxically increase the risk of psychological disturbance after injury athletes with a deeply internalized athletic identity are more likely to experience a loss of meaning and emotional destabilization when removed from sport [1].

5. THE IMPACT OF PSYCHOLOGICAL STATE ON INJURY SUSCEPTIBILITY

An increasing body of evidence highlights the significant influence of psychological factors on the risk of sports injuries among young athletes. Although injuries have traditionally been viewed through biomechanical and physiological lenses, contemporary research emphasizes that mental condition can play a key role in the mechanisms leading to injury [5–7].

5.1 STRESS, PRESSURE, PERFECTIONISM, AND MENTAL FATIGUE AS RISK FACTORS

Emotional stress whether stemming from sports-related pressure or external sources such as school or family can impair concentration, slow reaction time, and compromise decision-making in dynamic contexts. Studies have shown that adolescents experiencing higher levels of stress and anxiety are more likely to sustain injuries than their psychologically stable peers [5,7,21]. Perfectionism, particularly its maladaptive forms such as excessive self-criticism, unrealistic expectations, and low satisfaction, is also associated with increased injury risk. Among youth triathletes, higher levels of perfectionism and anxiety symptoms were linked to more frequent injuries [5]. Mental fatigue, caused by prolonged emotional overload and insufficient recovery, has been identified as an independent risk factor for injury regardless of physical training load [6,22].

5.2 THEORETICAL MODELS

Several models have been proposed to explain the psychological mechanisms underlying injury risk. One of the most frequently cited is the stress–injury model by Williams and Andersen [23], which posits that high stress levels, combined with poor coping strategies and low social support, increase injury risk through effects on muscle tension, attentional focus, and decision-making [5,9,14].

Another concept is the mental recovery deficiency model [24], which suggests that athletes exposed to chronic cognitive and emotional overload without adequate time to replenish mental resources are more susceptible to microtraumas and technical errors [6].

5.3 EXAMPLES FROM PROSPECTIVE STUDIES

In a study by Sonesson et al., young floorball players with elevated stress levels, poor sleep quality, and reduced psychological well-being were significantly more likely to experience both injuries and seasonal illness [7,25]. These findings support the notion that psychological vulnerability can serve as an early warning signal for injury development.

Neumann et al. proposed an innovative approach to injury prediction based on psychophysiological fluctuations that precede injury events. They advocate for continuous monitoring of psychological state including perceived load, mood, and heart rate variability as a potential preventive tool in identifying individual risk [6].

6. RETURN TO SPORT AND MENTAL HEALTH

Returning to sport after an injury is not only a physical challenge but also a psychological one, especially for young athletes. The recovery period often involves the loss of routine, social role, and contact with peers, which may lead to anxiety, frustration, and reduced motivation for continued activity. In many cases, it is not physical limitations but psychological barriers that determine the duration and quality of return to sport [1,2].

6.1. PSYCHOLOGICAL BARRIERS TO RETURNING TO ATHLETIC ACTIVITY

One of the most frequently reported issues is fear of reinjury a concern about getting hurt again that influences an athlete's behavior during training and competition. Young athletes may avoid full engagement, alter their movement patterns, or even withdraw from participation altogether, despite being physically cleared to return [1,2]. Studies show that individuals with higher levels of fear are more likely to suffer recurrent injuries, such as repeated ACL tears [1].

Return to sport may also be hindered by reduced self-confidence, low self-esteem, lack of motivation, and changes in lifestyle or priorities following injury. Limited support from peers, coaches, or family members further reinforces these mechanisms [2].

6.2 THE PROCESS OF PSYCHOLOGICAL PREPARATION FOR RETURN

A successful return to sport should be approached as a process that integrates both physical and emotional components. It involves redefining athletic goals and motivation, preparing both body and mind to re-enter the competitive environment, and accepting the inherent risk of reinjury. Neglecting the psychological dimension of this process may result in premature or incomplete return [26], increasing the likelihood of further injury and mental health deterioration [1,2].

6.3 THE IMPORTANCE OF SYSTEMIC SUPPORT AND PSYCHOLOGICAL INTERVENTIONS

Research highlights that psychological interventions both individual (e.g., cognitive reframing) and environmental (e.g., support from family, coaches, and teammates) play a crucial role in facilitating reintegration [2]. Studies show that only interventions combining psychotherapy with physiotherapy lead to meaningful improvements in psychological outcomes such as anxiety levels, kinesiophobia, and post-surgical satisfaction [2].

Individualized return-to-sport plans, developed collaboratively by parents, physiotherapists, coaches, and mental health professionals, increase the likelihood of full recovery and reduce the risk of reinjury [1,2].

6.4 LONG-TERM IMPACT AND QUALITY OF LIFE AFTER RETURN

Returning to sport does not always equate to a return to pre-injury functioning. In the case of high-impact injuries (e.g., ACL tears), many young athletes fail to regain their previous levels of physical, social, and emotional performance. Persistent limitations can negatively affect quality of life, identity development, and long-term engagement in physical activity [1].

7. MODERATING AND PROTECTIVE FACTORS

The course of a sports injury, its psychological consequences, and the return-to-sport process are not uniform and depend on a variety of moderating factors. These can either increase an adolescent athlete's

vulnerability to psychological difficulties or protect against them. The most commonly studied factors include age, sex, sport discipline, level of specialization, social support, and individual mental resilience [3,7,16,19,27,28].

7.1 AGE AND SEX

Epidemiological studies show that girls are more prone to injuries than boys, particularly regarding knee and lower limb injuries. At the same time, adolescent females exhibit greater emotional sensitivity and are more likely to respond to injuries with depressive or anxiety symptoms [3,17]. In contrast, boys more often experience overuse injuries in the spine and shoulders, largely due to greater participation in contact sports [17].

Age also plays a critical role, with the highest vulnerability observed during peak height velocity (ages 12–15), a developmental phase during which the musculoskeletal system is particularly susceptible to overload, and emotional stability may be compromised [11,16].

7.2 SPORT DISCIPLINE AND SPECIALIZATION LEVEL

7.3 SOCIAL SUPPORT

Support from family, peers, coaches, and medical staff plays a crucial role in protecting young athletes' mental health during recovery. The presence of close and supportive relationships facilitates faster healing, reduces feelings of isolation, and improves emotional functioning [2,3,28]. In contrast, lack of adequate support or social disintegration within the team environment can be psychologically traumatic and increase the risk of long-term mental health issues [1,2].

7.4 MENTAL RESILIENCE AND COPING MECHANISMS

Table 2. Psychological Outcomes and Key Moderators in Adolescent Athletes Following Sports Injuries

Outcome/ Variable	Reported Effects in Literature	Moderating Factors	Representative Studies
Anxiety and Depression	Increased risk after injury	Social support, coping style, time off sport	[13], [15], [22]
Identity Loss and Self-esteem	Often reduced after severe injury	Age, competitive level	[9], [17], [23]
Fear of Reinjury	Affects return-to-sport readiness	Psychological readiness, previous injury	[10], [14], [25]
Academic and Social Withdrawal	Temporary or persistent disengagement	Rehabilitation setting, team contact	[12], [20]

8. INTERVENTIONAL AND PREVENTIVE STRATEGIES

8.1INJURY PREVENTION: PHYSICAL AND PSYCHOLOGICAL PROGRAMS

Contemporary approaches to injury prevention in adolescent athletes emphasize the integration of both physical and psychological strategies. Neuromuscular training programs, such as FIFA 11+ and iPrevent ACL, designed to enhance proprioception, stability, and motor control, have demonstrated substantial effectiveness in reducing the risk of lower limb injuries, especially in team sports. Well-structured and regularly applied prevention programs may lower injury rates by up to 50%, particularly when adapted to the athlete’s age and sex [12,14]. Increasing attention is also being paid to psychological factors, which are now recognized as equally relevant risk determinants. Stress-reduction interventions, emotional regulation techniques, and relaxation-based approaches such as mindfulness are being introduced into youth sport settings, although empirical evidence on their effectiveness remains limited [1,29].

One study applied a multicomponent stress-reduction program in young football players that included muscle relaxation, mindfulness, visualization, and attentional control. The results showed a significant

reduction in injury incidence in the intervention group compared to controls [14]. A promising direction is the use of digital tools, such as mobile applications incorporating mood monitoring, psychological exercise guidance, and educational support. Programs like "Mental Warmup for Athletes" have been shown to improve psychological readiness and reduce pre-performance tension in adolescent athletes [14].

8.2 POST-INJURY INTERVENTIONS: CLINICAL AND PSYCHOSOCIAL SUPPORT

Rehabilitation after injury must address both the restoration of physical function and the rebuilding of mental well-being. Young athletes frequently experience emotional responses such as fear of reinjury, loss of athletic identity, social withdrawal, and decreased self-esteem. Studies have shown that incorporating psychological interventions into treatment such as cognitive reframing, imagery, and mindfulness results in better return-to-sport outcomes, reduced kinesiophobia, and higher postoperative satisfaction [2,13,29].

Adolescents often struggle with frustration due to their disconnection from the team environment, and recovery can lead to feelings of exclusion. Therefore, maintaining a link to the sports community from the early stages of injury is crucial. Allowing injured athletes to participate in team activities as observers or assistants helps preserve their sense of belonging and motivation to recover [2]. It is also important to tailor interventions based on gender: girls more often benefit from emotional monitoring and interpersonal support, while boys tend to respond better to strategies emphasizing positive reinforcement and task focus [2].

Research has also identified that maladaptive coping mechanisms such as withdrawal or emotional suppression can negatively affect mental health and prolong recovery. Thus, psychological interventions should include skills training in emotional regulation, realistic goal-setting, and adaptive thinking. These approaches have proven more effective when implemented by trained sport psychologists [2].

8.3 THE ROLE OF SPORT PSYCHOLOGISTS, PHYSIOTHERAPISTS, AND INTERDISCIPLINARY TEAMS

The most effective psychological support following injury is delivered through collaboration among specialists within an interdisciplinary team. The integration of physicians, physiotherapists, psychologists, coaches, and family members allows for a comprehensive view of the athlete's health and psychosocial needs. This model supports the development of individualized return-to-sport plans that take into account emotional, educational, and functional dimensions [2,9].

Sport psychologists play a central role in helping young athletes adapt to their new reality, accept limitations, and rebuild a sense of efficacy. Their collaboration with physiotherapists allows for coordinated monitoring of both physical progress and psychological readiness, which facilitates a safer and more sustainable return to activity [2]. The literature further emphasizes that actions such as setting shared goals, involving parents in rehabilitation, and educating coaches on mental health significantly improve recovery outcomes and reduce reinjury risk [2,14].

9. DISCUSSION

Analysis of the available data clearly indicates that sports injuries can have a significant impact on the mental health of adolescents. The most frequently observed psychological responses include depressive and anxiety symptoms, social withdrawal, and adjustment difficulties. In the case of more severe injuries or prolonged recovery periods, these symptoms may persist beyond the completion of physical rehabilitation [1,2,4]. Reports also suggest an increased prevalence of PTSD symptoms in older adolescents, potentially due to greater performance pressure and stronger identity investment in the athlete role [1].

Loss of control, sudden disruption of physical activity, and violation of athletic identity play a substantial role in shaping psychological responses to injury. These mechanisms appear particularly relevant during adolescence, a period in which sport often constitutes a central component of identity and social structure. A strong identification with the athlete role may paradoxically increase vulnerability to mood disturbances, especially when combined with team separation and loss of daily training routines [1,2].

Conversely, psychological state prior to injury may also influence susceptibility to injury. High levels of stress, anxiety, perfectionism, and mental fatigue have repeatedly been identified as predictors of injury in prospective studies [5,7]. Theoretical models, such as the stress–injury model or insufficient psychological recovery, offer helpful interpretive frameworks, yet are rarely applied in clinical screening or practice.

Findings concerning return to sport show that even after full physical recovery, many young athletes do not feel mentally prepared to resume competition. Fear of reinjury, decreased motivation, and lack of adequate support may lead to recurrent injury or withdrawal from participation [1,2]. This underscores the necessity for a holistic approach to rehabilitation one that addresses both physical and psychological readiness.

It is important to note that most available studies are cross-sectional and based on self-reported data.

There is a lack of longitudinal prospective studies that could identify actual cause-and-effect mechanisms between injury and mental health. Moreover, the standardization of tools for psychological assessment in adolescent athlete populations remains limited, which complicates comparison of results and formulation of practical recommendations [1,7].

Overall, the evidence supports the view that adolescence is a particularly sensitive developmental period in which sport functions not only as physical activity but also as a fundamental source of identity, self-worth, and social integration. In this context, a sports injury particularly one with significant functional impact may evolve into a psychological crisis, not merely an orthopedic issue. This highlights the need not only for further research, but also for re-evaluation of the role of mental health support in everyday practice with youth engaged in both amateur and competitive sports.

10. CONCLUSIONS

Sports injuries in adolescent populations are complex phenomena with multidimensional consequences that extend beyond somatic aspects. The literature review confirms that injuries may significantly impair mental well-being, including depressive and anxiety symptoms, loss of athletic identity, and disturbances in social and emotional functioning. These symptoms often emerge in the acute phase of injury and, in the case of severe trauma, may persist beyond the completion of physical treatment.

Moreover, existing data suggest that the psychological condition of young athletes prior to injury may significantly influence their vulnerability to trauma. Stress, emotional overload, perfectionism, and insufficient psychological recovery have been identified as risk factors for injury, regardless of physical load. In this context, sport may function both as a protective factor and a psychological stressor, particularly when associated with excessive emotional burden or performance pressure.

The return-to-sport process also presents multiple challenges. Even after regaining full physical capacity, many young athletes do not feel ready to resume activity due to fear of reinjury, reduced confidence, and lack of perceived control. These factors may prolong rehabilitation, reduce return-to-play quality, and, in some cases, lead to withdrawal from sport altogether.

The reviewed literature emphasizes the moderating role of factors such as age, sex, type of sport, level of specialization, availability of social support, and individual psychological resilience. Adolescence is a period of intense psychosocial development in which sport often plays a central role in identity formation. Injury during this developmental stage can impose significant psychological burden and potentially disrupt emotional and social maturation.

Effective preventive and interventional strategies should incorporate both physical and psychological components, implemented in an integrated manner by interdisciplinary teams. There is a need for further standardization of psychological assessment tools and the conduct of longitudinal studies to better understand causal mechanisms and to develop effective mental health support models for young athletes.

DISCLOSURE

AUTHORS' CONTRIBUTION:

Conceptualization: JN

Methodology: JN

Software: JN, AŚ, IB, AS

Check: JN, PK AŚ, KK

Formal analysis: JN, AŚ, KK, AS

Investigation: JN, LM, KC, SL

Resources: JN, SL, KC, LM

Data curation: JN, SL, LM, PK

Writing -rough preparation: JN, KSB, AS, IB

Writing -review and editing: JN, KK, KC

Visualization: JN, IB, KSB

Supervision: JN

Project administration: JN, PK

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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