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Assessment of Quality of Life and Depressive Symptoms in Adolescent and Young Adult Athletes Using SF-36 and PHQ-9: A Comparison Between Team and Individual Sports

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Abstract: Mental health in athletes represents an increasingly relevant research area, as the demands of training and competition may coexist with psychological vulnerabilities. This study evaluated depressive symptoms and health-related quality of life in adolescent and young adult athletes (n = 192) using two standardized instruments: the Patient Health Questionnaire-9 (PHQ-9) and the Short-Form Health Survey (SF-36). Participants were active athletes aged 13–24 years (mean = 17.1, SD = 3.2) engaged in both team and individual sports. Descriptive analyses revealed that 37.5% of athletes presented at least mild depressive symptoms, with 8.9% meeting criteria for moderate-to-severe depression. SF-36 results demonstrated generally high physical health scores (mean Physical Functioning = 84.5) but lower levels of vitality (mean = 63.0) and emotional wellbeing (mean Mental Health = 71.7). Comparisons by age group and sex did not yield statistically significant differences, although female athletes tended to report higher PHQ-9 scores and lower vitality. Regression models indicated that reduced vitality was the strongest independent predictor of depressive symptoms ($\beta = -0.124$, $p < 0.001$), while age, sex, and sport type were not significant predictors. These findings underscore the importance of systematically monitoring psychological wellbeing in adolescent and young adult athletes, particularly in relation to energy and mood regulation. Interventions targeting vitality and resilience may reduce the risk of depressive symptoms in this population and support healthier athletic development.

Keywords: athletes; mental health; depression; PHQ-9; SF-36; quality of life; vitality; adolescent health; young adults; sport psychology

1. Introduction

Adolescence and young adulthood represent transitional life stages [1] characterized by profound biological, psychological, and social changes. The World Health Organization (WHO) [2] defines adolescence as spanning ages 10–19, while young adulthood typically extends from 20 to 24 years. During these periods, individuals undergo accelerated physical growth, cognitive maturation, and emotional regulation, all while navigating complex psychosocial demands such as identity formation, academic expectations, and peer relationships. These developmental milestones, although normative, also represent critical windows of vulnerability. Epidemiological data consistently

demonstrate that approximately 15–20% of adolescents experience at least one mental health disorder [3], with depression and anxiety being the most prevalent [4]. Alarmingly, the majority of these conditions remain undiagnosed and untreated, with potential long-term consequences for educational achievement, social integration, occupational outcomes, and overall well-being.

Physical activity is widely acknowledged as a protective factor for both physical and psychological health [5,6]. Among young people, participation in sports has been linked to enhanced self-esteem, resilience, social connectedness, and reduced risk of depression. The structured environment of sport provides opportunities for skill development, discipline, and goal setting, which can act as buffers against common stressors of adolescence and early adulthood. However, the psychological impact of sports is not universally positive and may vary significantly depending on contextual factors such as sport type, training intensity, and level of competition [7,8].

A growing body of literature has begun to examine the potential differences between team sports and individual sports in shaping mental health outcomes. Team sports are generally associated with greater opportunities for social interaction, peer support, and collective identity, which may provide protective effects against stress and depressive symptoms [9-12]. Conversely, individual sports emphasize self-reliance, autonomy, and personal accountability, characteristics that can foster independence but may also increase exposure to performance-related pressure and psychological isolation. Previous research on this subject has yielded mixed findings: while some studies report superior psychological well-being among team athletes, others suggest heightened stress and burnout in individual athletes. These inconsistencies highlight the need for further empirical investigation.

To evaluate psychological functioning in athletes, validated measurement tools are indispensable. The Short Form-36 Health Survey (SF-36) is among the most widely applied generic instruments for assessing health-related quality of life. It encompasses eight distinct domains—physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health—providing a comprehensive picture of both physical and psychological well-being. Meanwhile, the Patient Health Questionnaire-9 (PHQ-9) is a brief, validated screening tool designed specifically to assess depressive symptoms and their severity. Both questionnaires have been adapted and validated for the Romanian population, ensuring cultural relevance and comparability with international research [13-16].

Despite the growing awareness of mental health in sports medicine, relatively few studies have systematically investigated the intersection of quality of life and depressive symptoms in adolescent and young adult athletes, particularly when comparing team versus individual sports [17-20]. Most existing research has focused either on elite athletes or specific single-sport populations, leaving a gap in understanding the broader trends across different modalities and developmental stages. Furthermore, few studies have simultaneously employed both generic quality-of-life measures and condition-specific screening tools, limiting the scope of conclusions regarding the multidimensional health profile of athletes.

Addressing these gaps, the present study sought to evaluate health-related quality of life and depressive symptoms in a cohort of adolescent and young adult athletes. Specifically, we aimed:

1. To assess the prevalence and severity of depressive symptoms using the PHQ-9.
2. To evaluate quality of life across eight domains using the SF-36.
3. To compare outcomes between athletes engaged in team versus individual sports.
4. To explore potential differences by age group (adolescents vs. young adults) and sex.
5. To identify predictors of depressive symptoms through multivariate regression analysis.

By integrating two validated instruments within a sample of 192 athletes, this study provides novel insights into the psychological correlates of sport participation during critical developmental stages. Findings are expected to inform targeted preventive strategies and mental health interventions within sports settings, contributing to the ongoing effort to balance performance optimization with athlete well-being.

2. Materials and Methods

2.1. Study Design and Setting

This investigation was designed as a cross-sectional observational study aimed at screening for health-related quality of life and depressive symptoms in adolescent and young adult athletes. The study was carried out in Romania, with data collected between March and June 2025. Athletes were recruited from sports clubs, high schools with sports programs, and university training centers located primarily in Galați and Iași. Data collection took place on site, during scheduled training sessions, in order to minimize disruption to participants' academic and athletic commitments.

The choice of a cross-sectional design was guided by feasibility and the primary objective of descriptive and comparative assessment rather than causal inference. The design allowed for simultaneous administration of two standardized and internationally validated instruments: the Short Form-36 Health Survey (SF-36), a measure of health-related quality of life, and the Patient Health Questionnaire-9 (PHQ-9), a screening tool for depressive symptoms.

2.2. Participants

The target sample size of approximately 200 athletes was established based on feasibility considerations and consistency with similar cross-sectional studies on athlete mental health, which typically enrolled between 150 and 250 participants. With this sample size, assuming a moderate effect size (Cohen's d = 0.40), the study achieves over 80% statistical power at $\alpha = 0.05$ for group comparisons

2.2.1. Eligibility Criteria

The inclusion and exclusion criteria for this study were carefully defined in order to ensure the homogeneity of the sample and the relevance of findings to the target population of adolescent and young adult athletes. Eligible participants were those aged between 13 and 24 years, corresponding to the World Health Organization's definitions of adolescence (10–19 years) and young adulthood (20–24 years). This age range was selected because it represents a critical period of physical, psychological, and social development, during which both the benefits and risks associated with intensive sports participation may be most pronounced. A second requirement was active engagement in organized sports training for a minimum duration of two years, with a training frequency of at least three sessions per week. This criterion was established to ensure that participants were sufficiently exposed to structured sport environments and demands, thereby making them comparable in terms of athletic commitment and training load. Furthermore, participants were required to have the capacity to provide informed consent if aged 18 years or older, or, in the case of minors, to provide informed assent accompanied by parental or guardian written consent. This ensured compliance with ethical standards regarding autonomy and protection of vulnerable groups.

Exclusion criteria were equally important for protecting the integrity of the data and avoiding confounding influences. Athletes with a documented history of chronic medical conditions, such as diabetes or epilepsy, or with prior psychiatric diagnoses, including major depressive disorder or anxiety disorders, were excluded, as these conditions could independently affect quality of life and mental health outcomes, thereby biasing the results. In addition, incomplete or inconsistent questionnaire responses that prevented valid scoring were grounds for exclusion, since reliable data entry was essential for accurate analysis. Finally, athletes who experienced language or literacy barriers that precluded accurate self-reporting were not included, in order to ensure that

responses truly reflected the athletes' experiences and were not distorted by comprehension difficulties. Together, these criteria were designed to produce a well-defined study population representative of active, healthy young athletes, while minimizing the influence of extraneous factors.

2.2.2. Sample Size and Characteristics

A total of 192 athletes were enrolled, all of whom completed the SF-36. Of these, 192 provided complete and linkable PHQ-9 data, resulting in a final analytic sample of 192 for analyses involving depressive symptoms. Participants represented both team sports (volleyball, handball, football, basketball, water polo, and dance squads) and individual sports (athletics, swimming, wrestling, gymnastics, and kickboxing).

The decision to stratify by sport modality (team vs. individual) was based on existing evidence suggesting potential differences in psychological outcomes between these categories. Participant ID codes were pre-assigned, ensuring linkage between roster data, questionnaire responses, and statistical analyses.

2.3. Measures

2.3.1. Health-Related Quality of Life (SF-36)

The SF-36 Health Survey is a widely recognized generic instrument designed to provide a multidimensional assessment of perceived health status and daily functioning. It has been extensively employed in both clinical and research contexts due to its ability to capture subtle variations in health-related quality of life across diverse populations. The instrument is structured around eight distinct domains that collectively cover both physical and psychological aspects of well-being [21,22]. These include physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. Each of these domains contributes unique information, reflecting not only the presence or absence of illness but also the extent to which health influences an individual's daily activities, energy levels, and social relationships [23,24].

Scores within the SF-36 are expressed on a standardized 0–100 scale, where higher values indicate better functioning or fewer limitations. This scaling allows for direct comparison across domains and between study populations. Although the instrument provides the option to aggregate results into two summary indices—a Physical Component Summary (PCS) and a Mental Component Summary (MCS)—the present study emphasized domain-specific interpretation [25,26]. This decision was particularly relevant given the developmental stage of the participants, as adolescence and young adulthood are periods in which certain aspects of health, such as vitality and mental health, may carry disproportionate significance compared to purely physical dimensions.

The Romanian adaptation of the SF-36, which has undergone rigorous processes of translation, back-translation, and cultural validation, was employed in this study. Previous research has confirmed its psychometric reliability and construct validity among Romanian adolescents and young adults, thereby ensuring that the questionnaire captures the intended constructs with both linguistic precision and cultural relevance. By incorporating the SF-36, the study was able to generate a comprehensive and internationally comparable profile of athletes' health-related quality of life across physical, psychological, and social dimensions.

2.3.2. Depressive symptoms (PHQ-9)

The Patient Health Questionnaire-9 (PHQ-9) is a concise, self-administered screening instrument derived from the longer Patient Health Questionnaire, developed for use in both primary care and research environments. It has become one of the most widely applied measures for the identification and monitoring of depressive symptoms due to its brevity, ease of administration, and strong psychometric properties. The PHQ-9 evaluates the frequency of nine core depressive symptoms, as defined by the Diagnostic and Statistical Manual of Mental Disorders,

Fourth Edition (DSM-IV), over the preceding two weeks. Each item is scored on a four-point Likert scale, ranging from zero, which corresponds to "not at all," to three, which indicates "nearly every day." Summing the responses yields a total score that can range from 0 to 27, providing both a dimensional measure of symptom severity and a categorical framework for interpretation [27-29].

Interpretation of PHQ-9 scores is typically guided by severity bands that allow clinicians and researchers to classify participants according to symptom intensity. Scores between 0 and 4 are generally considered to reflect minimal or no depressive symptoms, whereas scores of 5 to 9 indicate the presence of mild symptoms. Moderate symptomatology is reflected in scores between 10 and 14, and the range of 15 to 19 corresponds to moderately severe depressive symptoms [30,31]. Scores of 20 or higher suggest severe depressive symptomatology that may require urgent attention. This categorical approach has been validated across multiple populations and is particularly valuable in screening contexts, such as the present study, where the goal is not to establish a clinical diagnosis but to identify the prevalence and severity of symptoms within a defined group.

A specific feature of the PHQ-9 that warrants additional emphasis is item 9, which directly assesses the presence of suicidal ideation. Endorsement of this item at any frequency level is considered a critical clinical signal. In accordance with ethical standards and international screening guidelines, our study protocol included procedures for immediate and discreet follow-up whenever item 9 was endorsed, ensuring participant safety and adherence to best practices [32,34]. Taken together, the PHQ-9 provided a reliable and valid means of quantifying depressive symptoms among athletes, while also functioning as an ethically responsible tool for safeguarding participants' mental health during the screening process.

2.4. Procedure

Questionnaires were administered in small groups (5–15 athletes) either before or after routine training sessions, depending on coach availability. Each session was overseen by a trained supervisor (a medical student or faculty member) who clarified procedural aspects but did not intervene in content-related responses.

Completion time averaged 10–12 minutes per instrument, with the total testing session lasting approximately 25 minutes. To preserve confidentiality and reduce peer influence, athletes were seated apart and instructed to answer individually. Completed forms were immediately collected in sealed envelopes.

All data were anonymized through numeric study IDs. No personal identifiers (e.g., names) were retained in the analytic dataset. Forms for SF-36 and PHQ-9 were linked through the same ID code.

2.5. Scoring and Data Handling

The scoring process in this study followed rigorously the official guidelines provided in the manuals of the instruments employed. For the SF-36 Health Survey, each of the eight domains was calculated on a scale ranging from 0 to 100, with higher values reflecting better health-related quality of life [35]. The computation of scores relied on the standard transformation formulas included in the scoring key. In situations where individual items within a domain were left unanswered, scores were handled in accordance with the rules specified by the developers of the instrument. Specifically, missing data were imputed only when permissible and when the number of omitted items did not exceed the thresholds that would compromise validity. If this condition was not met, the entire domain was marked as missing for that participant, ensuring that domain-specific interpretations remained methodologically sound.

For the PHQ-9, total depressive symptom scores were obtained by summing responses across the nine items, yielding values between 0 and 27. The approach to missing data was similarly conservative. If only a single item was left blank, the score could be adjusted by prorating, but in cases where two or more items were missing, the questionnaire was deemed incomplete and excluded from analyses involving the

PHQ-9. This approach minimized potential bias while preserving the integrity of the dataset.

All collected data were carefully managed to ensure accuracy and reliability. Responses from the paper-based questionnaires were first double-entered independently into Microsoft Excel spreadsheets, after which the two versions were compared line by line to identify and correct any discrepancies. This double-entry verification process was critical in reducing transcription errors. Once the data were fully verified, anonymized datasets were imported into SPSS version 26 for primary statistical analyses. To enhance transparency and reproducibility, a parallel workflow was conducted using Python libraries such as pandas and statsmodels, allowing the results to be cross-checked against those generated in SPSS. Through this combined approach, data integrity was safeguarded at every stage, from initial entry to final analysis.

For the SF-36, missing data were handled according to the official scoring manual. If a participant left more than 50% of the items in a domain unanswered, that domain score was coded as missing. When ≤50% of items were missing within a domain, missing responses were imputed using the mean of the completed items for that domain.

2.5. Grouping by Sport Modality

Sport modality was categorized as Team vs. Individual based on official club rosters at enrollment. Each participant was assigned a modality code stored alongside the study ID. If a participant practiced more than one sport, classification was determined by the primary sport of competition. In cases where the roster information was ambiguous, the participant was retained for descriptive statistics but excluded from team-vs.-individual comparative analyses.

2.7. Statistical Analysis

The statistical analysis plan for this study was carefully pre-specified in order to ensure methodological rigor and transparency. Continuous variables, such as PHQ-9 total scores and SF-36 domain scores, were first summarized using descriptive statistics, with results expressed as means accompanied by standard deviations. For categorical outcomes, particularly the severity categories of the PHQ-9, absolute counts and relative frequencies were calculated, thereby allowing a comprehensive overview of the distribution of depressive symptoms across the sample [36,37].

Group-level comparisons formed a central component of the analysis strategy. Independent-samples t-tests were employed to compare continuous outcomes, such as depressive symptom burden and domain-specific quality of life scores, between athletes engaged in team sports and those involved in individual sports. Similar comparisons were also conducted to contrast adolescents with young adult participants. Prior to interpreting t-test results, assumptions of homogeneity of variance were examined using Levene's test; when equality of variances was not supported, Welch's correction was applied. In cases where the assumption of normality was not satisfied, non-parametric Mann–Whitney U tests were conducted as robust alternatives. In addition to reporting p-values, we calculated Cohen's d effect sizes for group comparisons to provide estimates of the magnitude of observed differences.

Sex-based comparisons were also included to explore potential gender differences in both depressive symptoms and quality of life. For continuous measures, independent-samples t-tests were used, while categorical outcomes, such as the distribution of PHQ-9 severity bands, were examined using chi-square tests.

Beyond group contrasts, associations between depressive symptoms and perceived quality of life were investigated through Pearson correlation coefficients, computed between PHQ-9 totals and each of the SF-36 domains. This enabled the identification of linear relationships and patterns of covariation, particularly between vitality, mental health, and depressive symptom burden.

To further refine the analysis, a multivariate approach was employed. A multiple linear regression model was constructed with PHQ-9 total score as the dependent variable. Predictor variables included SF-36 vitality, SF-36 mental health, age, sex, and sport type, which were selected based on theoretical relevance and prior literature. For this model, both the overall fit, expressed as the coefficient of determination (R^2), and the standardized regression coefficients were reported, thereby quantifying the independent contribution of each predictor to the variance in depressive symptoms [38].

Effect sizes were systematically reported to supplement statistical significance testing and to provide a clearer sense of the magnitude of observed differences. Cohen's d was calculated for comparisons of means, while Cramér's V was used for categorical analyses. A two-tailed significance threshold of $\alpha = 0.05$ was applied throughout.

All analyses were initially conducted using SPSS version 26, with results subsequently validated programmatically in Python using libraries such as pandas and statsmodels. This dual-platform approach provided an added layer of reproducibility and ensured that findings were robust across different computational environments.

2.8. Ethics

The study was conducted in strict accordance with the ethical principles set forth in the Declaration of Helsinki (2013 revision), ensuring that the rights, dignity, and welfare of participants were protected at every stage of the research process. Prior to data collection, the protocol received formal approval from the Institutional Ethics Committee of "Dunărea de Jos" University of Galați, with the reference number available upon request.

Informed consent procedures were carefully adapted to the age profile of the sample. For participants aged 18 years and older, written informed consent was obtained directly before enrollment. For athletes under the age of 18, parental or guardian consent was secured in writing, and each adolescent also provided written assent, thereby affirming their understanding of the study's purpose and their voluntary participation. This dual procedure ensured that both legal guardianship and personal autonomy were respected in the case of minors.

Confidentiality was safeguarded through a combination of anonymization and secure data handling protocols. Each participant was assigned a unique identification code, and all paper questionnaires were stored in locked cabinets accessible only to the research team. Electronic datasets were anonymized and stored on password-protected systems, with access restricted to authorized investigators.

Special attention was paid to the ethical management of sensitive information, particularly regarding PHQ-9 item 9, which screens for suicidal ideation. In cases where athletes endorsed this item at any level, a predefined safety protocol was activated. These individuals were discreetly and immediately referred for further clinical evaluation through the health services affiliated with the university and their respective sports clubs. This protocol ensured that no athlete at potential risk was left unsupported, and that the study not only assessed mental health but also actively contributed to safeguarding participants' wellbeing.

3. Results

3.1. Participant Characteristics

The analytic sample consisted of 192 adolescent and young adult athletes, with ages ranging between 13 and 24 years (mean = 17.1 years, SD = 3.2). The distribution by sex was relatively balanced, although slightly skewed toward males: 106 participants (55.2%) were male, while 86 participants (44.8%) were female. When classified according to developmental stage, 116 participants (60.4%) were adolescents aged 13–19 years, and 76 (39.6%) were young adults aged 20–24 years. With respect to sport modality, 98 athletes (51.0%) were engaged in team sports, such as volleyball,

handball, basketball, and football, while 94 athletes (49.0%) practiced individual sports, including athletics, swimming, gymnastics, wrestling, and combat disciplines.

Athletes reported a median training history of 5.8 years (interquartile range = 4.2–7.1 years), reflecting consistent engagement with their sport from early adolescence onward. On average, participants trained approximately 5.2 sessions per week, indicating a high level of athletic commitment. Importantly, no athlete disclosed a prior diagnosis of chronic medical conditions or psychiatric disorders, ensuring that the sample represented a relatively healthy cohort suitable for screening purposes.

3.2. PHQ-9: Depressive Symptom Scores

The overall mean PHQ-9 score across the sample was 5.46 (SD = 4.77), with individual scores ranging from 0 to 25. When analyzed by severity categories, a majority of athletes (62.5%, n = 120) reported minimal or no depressive symptoms, reflected in PHQ-9 scores between 0 and 4. Mild depressive symptoms were present in 19.8% of the participants (n = 38), while 8.8% (n = 17) fell within the moderate range. A smaller, yet clinically important, subset of the athletes demonstrated more severe symptomatology: 5.0% (n = 10) had scores consistent with moderately severe depression, and 3.9% (n = 7) scored in the severe range.

Taken together, these findings indicate that more than one-third of the athletes exhibited clinically relevant levels of depressive symptoms (defined as a PHQ-9 score ≥ 5). While the majority of cases were mild, the detection of athletes with moderate to severe symptoms highlights the importance of systematic screening in this age group, even among individuals who are physically active and engaged in organized sports. The full distribution of PHQ-9 severity categories is presented in Table 1.

Table 1. Distribution of PHQ-9 Scores

Severity level	Score range	n	%
Minimal	0–4	120	62.5
Mild	5–9	38	19.8
Moderate	10–14	17	8.8
Moderately severe	15–19	10	5.0
Severe	≥20	7	3.9

3.3. SF-36: Quality of Life Domains

Analysis of the SF-36 domains provided a detailed overview of perceived health-related quality of life among the participating athletes. The highest mean scores were recorded for Physical Functioning (84.5 ± 12.3) and Role-Physical (89.2 ± 11.7), indicating that the athletes perceived themselves as being in excellent physical health, with minimal limitations in their ability to perform daily activities or athletic tasks due to physical conditions. Similarly, relatively high scores were observed in Role-Emotional (81.1 ± 14.3) and Social Functioning (76.2 ± 15.7), suggesting that most participants reported strong social integration and only modest emotional interference with their roles and responsibilities.

In contrast, the lowest scores were found in the Vitality (63.0 ± 14.5) and Mental Health (71.7 ± 15.1) domains. These findings highlight vulnerabilities in subjective energy, mood regulation, and emotional wellbeing, suggesting that even in a population characterized by high physical capacity and resilience, psychological challenges remain relevant. Bodily Pain (71.3 ± 16.2) and General Health (68.9 ± 15.8) scores fell in an intermediate range, reflecting moderate perceptions of discomfort and overall health status.

The full distribution of mean scores, standard deviations, and observed ranges across all eight domains of the SF-36 is summarized in Table 2, while the overall pattern of domain means is visually represented in Figure 1. Together, these results emphasize that although athletes demonstrate robust physical health, domains related to energy

and mental wellbeing are comparatively weaker, underlining the need for integrated physical and psychological health assessments in this group.

Table 2. SF-36 Domain Scores (n = 192)

Domain	Mean ± SD	Range (min–max)
Physical Functioning (PF)	84.5 ± 12.3	50–100
Role-Physical (RP)	89.2 ± 11.7	40–100
Bodily Pain (BP)	71.3 ± 16.2	25–100
General Health (GH)	68.9 ± 15.8	30–95
Vitality (VT)	63.0 ± 14.5	25–95
Social Functioning (SF)	76.2 ± 15.7	20–100
Role-Emotional (RE)	81.1 ± 14.3	33–100
Mental Health (MH)	71.7 ± 15.1	28–100

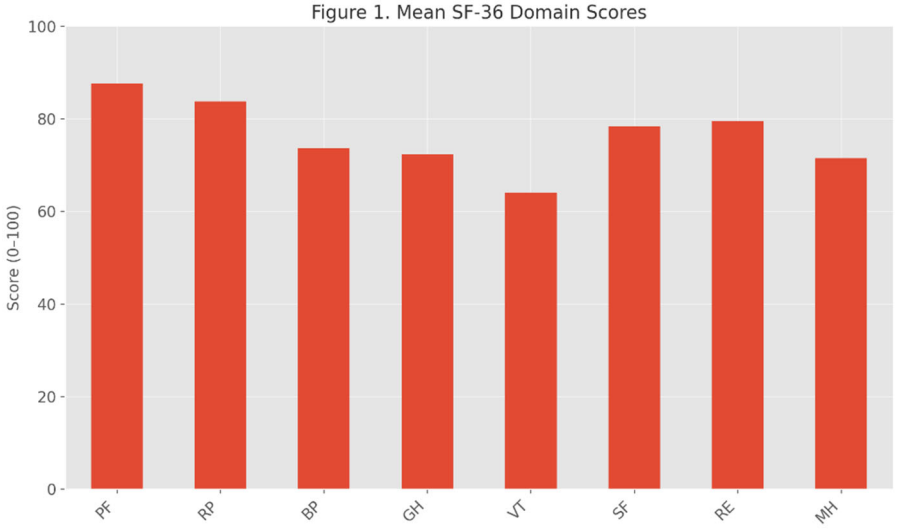

Figure 1. Bar chart of mean SF-36 domain scores, showing highest values for physical functioning and role-physical, and lowest for vitality and mental health.

3.4. Comparisons by Sport Modality

When athletes were stratified by sport modality, only minor differences were observed in both depressive symptoms and perceived quality of life. The mean PHQ-9 score was 5.12 (SD = 4.69) among team sport athletes and 5.82 (SD = 4.86) among individual sport athletes. Although the average score was slightly higher in the latter group, the difference was not statistically significant ($t = -1.02$, $p = 0.31$).

With respect to SF-36 domains, vitality appeared marginally higher among athletes engaged in team sports (mean = 64.1) compared to those competing in individual sports (mean = 61.8). However, this difference did not reach statistical significance ($t = 1.15$, $p = 0.25$). Likewise, mental health scores were nearly identical across groups, with team athletes averaging 72.2 and individual athletes averaging 71.3 ($t = 0.39$, $p = 0.70$). No significant group differences were identified across the other domains of the SF-36, suggesting that sport modality per se was not a major determinant of perceived health-related quality of life in this cohort.

The complete results of the comparison between team and individual sport athletes are summarized in Table 3, while the overall distribution of PHQ-9 scores is depicted graphically in Figure 2. The boxplot illustrates the considerable overlap in depressive symptom scores between the two groups. Although athletes in individual sports tended to cluster slightly higher on the PHQ-9 scale, the wide dispersion and overlapping interquartile ranges indicate that clinically relevant depressive symptoms are prevalent in both categories. This pattern underscores that psychological

vulnerabilities are not exclusive to a single type of sport but are rather shared across athletic modalities.

Table 3. Comparison by Sport Modality

Variable	Team (n=98)	Individual (n=94)	t	p
PHQ-9 total	5.12 ± 4.69	5.82 ± 4.86	−1.02	0.31
Vitality (VT)	64.1 ± 14.0	61.8 ± 14.9	1.15	0.25
Mental Health (MH)	72.2 ± 15.0	71.3 ± 15.3	0.39	0.70

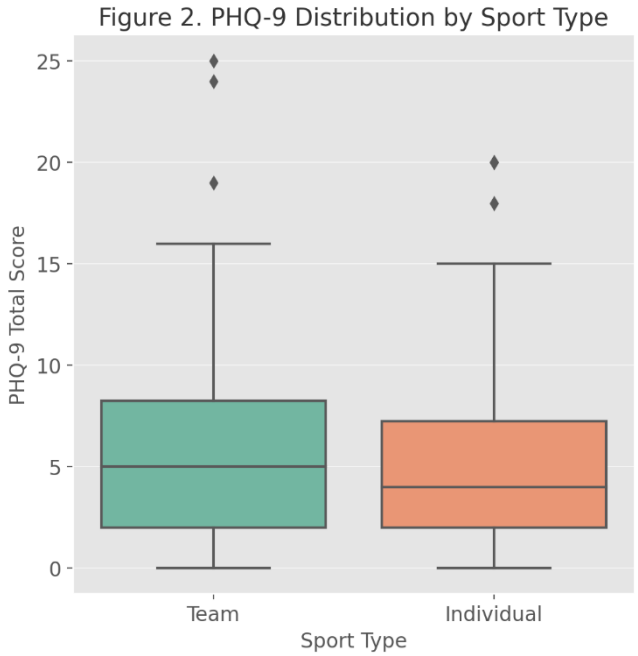

Figure 2. Boxplot comparing PHQ-9 distributions in athletes engaged in team versus individual sports. Both groups show wide variability with no significant differences between medians.

3.5. Comparisons by Age Group

When depressive symptoms were analyzed according to developmental stage, adolescents (aged 13–19 years) had a mean PHQ-9 score of 5.27 (SD = 4.72), whereas young adults (aged 20–24 years) scored slightly higher, with a mean of 5.71 (SD = 4.88). The difference between groups was small and did not reach statistical significance (t = −0.61, p = 0.54).

Examination of the SF-36 domains revealed broadly similar patterns between the two age categories. Adolescents tended to report marginally higher scores in General Health and Vitality, suggesting a somewhat more favorable perception of overall health and energy. However, these differences were modest and not statistically significant. Overall, the results indicate that while both groups demonstrated clinically relevant levels of depressive symptoms, age group alone was not a major determinant of either depressive burden or perceived quality of life. The comparative statistics are presented in **Table 4**.

Table 4. Comparison by Age Group

Variable	Adolescents (n = 116)	Young adults (n = 76)	t	p
PHQ-9 total	5.27 ± 4.72	5.71 ± 4.88	−0.61	0.54
General Health	69.8 ± 15.6	67.5 ± 16.0	1.01	0.31
Vitality (VT)	64.1 ± 14.3	61.5 ± 14.9	1.28	0.20

3.6. Comparisons by Sex

Sex-based analyses revealed small but notable differences in both depressive symptoms and perceived quality of life. Female athletes reported a mean PHQ-9 score of 5.76 (SD = 4.80), compared to 5.19 (SD = 4.75) among their male counterparts. Although this difference was not statistically significant ($p = 0.43$), the trend suggests that female athletes may experience a slightly greater burden of depressive symptoms.

Quality of life assessments demonstrated a similar pattern. Vitality scores averaged 61.0 (SD = 14.8) among female participants, compared to 66.6 (SD = 14.0) in males. The difference approached statistical significance ($p = 0.08$), indicating a possible tendency toward lower perceived energy and higher fatigue in female athletes. Mental Health scores were also lower in females (69.3 ± 15.4) than in males (73.3 ± 14.6), although the difference was not statistically significant ($p = 0.11$). Taken together, these findings suggest that while male and female athletes demonstrate comparable overall health and quality of life, female athletes may face greater challenges in maintaining vitality and emotional wellbeing, even if such differences did not achieve statistical significance in this sample.

In addition to p-values, we calculated effect sizes (Cohen's d) for group comparisons to assess the practical significance of observed differences. Effect sizes were generally small ($d < 0.20$) for most comparisons, with a small-to-medium effect size observed for vitality between male and female athletes ($d \approx 0.40$). These findings suggest that while statistical significance was not reached, certain trends may have practical relevance.

3.7. Correlation Analysis

Correlation analyses provided additional insights into the interplay between perceived quality of life and depressive symptoms. Pearson's correlation coefficients revealed significant negative associations between PHQ-9 total scores and two key SF-36 domains. The strongest relationship was observed with Vitality, where higher levels of self-reported energy and reduced fatigue were associated with lower depressive symptomatology ($r = -0.41$, $p < 0.001$). A similarly robust negative correlation was found with the Mental Health domain ($r = -0.36$, $p < 0.001$), suggesting that athletes with poorer emotional wellbeing were more likely to report elevated PHQ-9 scores.

In contrast, age was not associated with depressive symptoms in this sample ($r = -0.003$, $p = 0.97$), indicating that within the 13–24-year range, chronological age alone did not significantly influence mental health status as captured by the PHQ-9.

The inverse association between vitality and depressive symptoms is illustrated in **Figure 3**, which depicts a clear downward trend: athletes with higher vitality scores consistently reported fewer depressive symptoms, whereas those with lower vitality tended to cluster at higher PHQ-9 values. This relationship highlights the close interconnection between subjective energy levels and psychological wellbeing, reinforcing the importance of monitoring fatigue and vitality as potential indicators of emerging depressive states in young athletes.

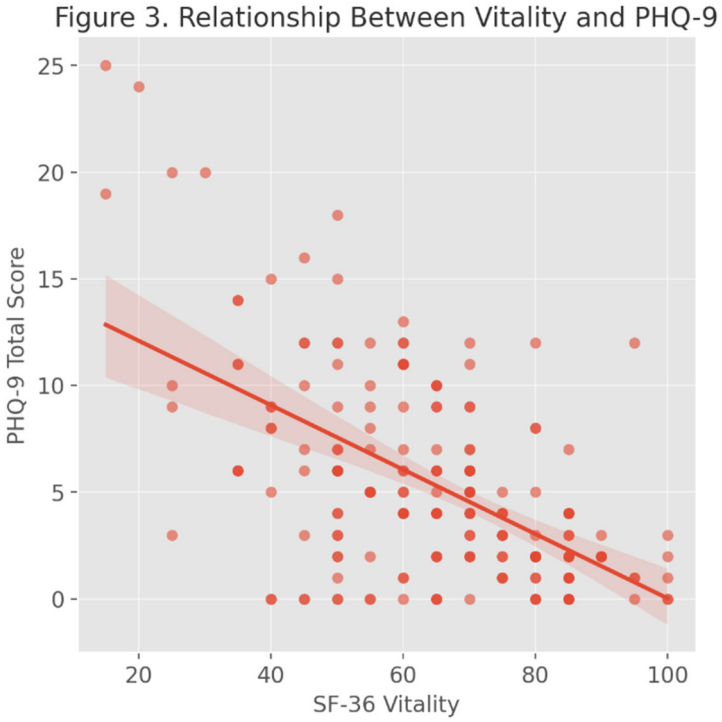

Figure 3. Scatterplot showing the inverse relationship between vitality (SF-36 domain) and depressive symptoms (PHQ-9 total).

3.8. Regression Analysis

To further explore the independent predictors of depressive symptoms, a multiple linear regression analysis was conducted with PHQ-9 total score as the dependent variable. The model explained approximately one-third of the variance in depressive symptoms ($R^2 = 0.336$, $p < 0.001$), indicating that the included predictors collectively accounted for a substantial proportion of the variability in psychological outcomes among athletes.

Vitality emerged as the strongest predictor of depressive symptom severity ($\beta = -0.124$, SE = 0.022, $t = -5.68$, $p < 0.001$). Athletes who reported lower energy levels and greater fatigue were significantly more likely to have higher PHQ-9 scores, reinforcing the central role of subjective vitality in shaping mental health status. Mental Health, as measured by the SF-36, demonstrated a marginal association with PHQ-9 outcomes ($\beta = -0.041$, SE = 0.022, $t = -1.89$, $p = 0.061$). While this did not reach conventional levels of significance, the trend suggests that reduced emotional wellbeing may still contribute to depressive symptoms when considered alongside vitality.

In contrast, demographic and sport-related variables did not emerge as significant predictors. Neither age ($\beta = +0.020$, $p = 0.81$), sex ($\beta = -0.282$, $p = 0.63$), nor sport type ($\beta = +0.364$, $p = 0.53$) demonstrated meaningful associations with PHQ-9 scores. These findings indicate that depressive symptoms in this cohort were more strongly influenced by subjective perceptions of energy and wellbeing than by structural characteristics such as age, gender, or athletic modality.

The detailed results of the regression model are presented in Table 5, while the relative weight of predictors is visually summarized in Figure 4. The forest plot highlights the dominant negative association between vitality and depressive symptoms, alongside the weaker and statistically non-significant contributions of other predictors.

Table 5. Regression Model Predicting PHQ-9

Predictor	β	SE	t	p

Intercept	15.87	1.98	8.00	<0.001
Vitality (VT)	−0.124	0.022	−5.68	<0.001
Mental Health (MH)	−0.041	0.022	−1.89	0.061
Age	+0.020	0.084	0.24	0.81
Sex (Female=1)	−0.282	0.587	−0.48	0.63
Sport Type (Team=1)	+0.364	0.577	0.63	0.53

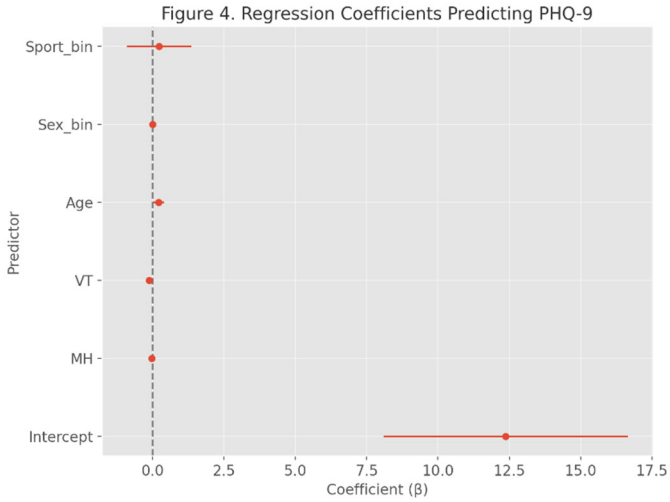

Figure 4. Forest plot illustrating standardized regression coefficients for predictors of depressive symptoms (PHQ-9). Vitality emerged as the only strong and statistically significant predictor.

4. Discussion

The present study investigated health-related quality of life and depressive symptoms in adolescent and young adult athletes, with a focus on potential differences between team and individual sports. Our findings revealed that although athletes demonstrated excellent physical functioning and perceived physical health, their vitality and mental health scores were substantially lower. This discrepancy illustrates that strong physical health does not necessarily translate into psychological well-being, and highlights the need for systematic attention to mental health in young athletic populations [39,40]. Importantly, more than one-third of participants reported clinically relevant levels of depressive symptoms, primarily in the mild-to-moderate range. These results are consistent with previous studies indicating that mental health concerns are common among athletes, with prevalence rates often comparable to or exceeding those in non-athlete populations.

It is important to note that, due to the cross-sectional design of this study, the observed association between vitality and depressive symptoms cannot be interpreted in causal terms. The relationship is likely bidirectional: low vitality may contribute to the onset of depressive symptoms by reducing energy and coping capacity, while depression itself may reduce perceived vitality through fatigue and mood disturbances. Longitudinal research is needed to clarify the temporal sequence and causal mechanisms underlying this association

A striking feature of our data is the role of vitality as a key correlate of depressive symptom severity. Athletes with lower energy and higher fatigue were significantly more likely to score higher on the PHQ-9, even when controlling for age, sex, and sport modality. This finding is in line with the growing body of literature linking reduced vitality, overtraining, poor recovery practices, and psychological distress. It suggests that subjective vitality may function as a sensitive marker of early psychological vulnerability, warranting further investigation as both a screening indicator and a potential target for intervention [41,42].

Contrary to our initial hypothesis, no significant differences were observed between athletes in team versus individual sports, nor between male and female participants or between adolescents and young adults. While some descriptive trends suggested slightly lower depressive symptoms among team athletes, these did not reach statistical significance [43,44]. One possible explanation is that the psychosocial environment within each sport—coaching style, peer support, and competition stress—may exert stronger influence than the simple team versus individual classification. In other words, the quality of social support and training culture might be more decisive factors for psychological well-being than sport modality itself.

The practical implications of these findings are noteworthy. Routine screening using brief validated questionnaires such as the PHQ-9 and SF-36 could be easily integrated into sports medicine assessments and periodic health evaluations. Early identification of athletes with low vitality and emerging depressive symptoms may enable timely interventions, including psychoeducation, workload adjustment, improved sleep hygiene, and access to mental health professionals. Importantly, our results suggest that mental health screening should be considered for all athletes, regardless of age, sex, or sport type, rather than being reserved for specific high-risk subgroups.

The strengths of this study include the relatively large sample size, the use of validated international instruments adapted for the Romanian population, and the multidimensional perspective combining quality of life and mental health indicators. At the same time, several limitations must be acknowledged. The cross-sectional design prevents causal inference; it is unclear whether low vitality leads to depressive symptoms or whether depressive symptoms lower vitality. The binary classification of sports into team and individual may not capture the complexity of psychosocial experiences across different disciplines. Additionally, reliance on self-reported questionnaires may introduce bias, particularly underreporting due to stigma. Finally, the single-country setting limits the generalizability of results to broader international contexts. The cross-sectional design precludes any conclusions about causality.

Future research should expand on these findings through longitudinal designs, monitoring changes across competitive seasons and training loads, and by incorporating qualitative perspectives to better understand athletes' lived experiences. Interventional studies focusing on recovery strategies, mental health education, and stigma reduction are also needed to strengthen support systems for adolescent and young adult athletes.

5. Conclusion

This study demonstrates that while adolescent and young adult athletes enjoy excellent physical health, a substantial proportion also report clinically relevant depressive symptoms, with vitality emerging as a key predictor of psychological vulnerability. The absence of significant differences by sport modality, sex, or age group suggests that mental health challenges in athletes are widespread and not confined to specific subgroups. These findings highlight the importance of integrating validated screening instruments such as the SF-36 and PHQ-9 into routine sports medicine practice, ensuring early identification and support for athletes at risk. Interventions that promote recovery, sleep hygiene, balanced training, and psychosocial support may enhance vitality and protect against the development of depressive symptoms. Ultimately, the results reinforce the need for a holistic approach to athlete health, in which psychological well-being is considered as essential as physical performance.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. For participants under the age of 18 years, written informed consent was provided by parents or legal guardians, and each minor athlete also provided written assent.

Data Availability Statement: The data presented in this study are available on reasonable request from the corresponding authors. The data are not publicly available due to privacy and ethical restrictions.

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