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REVIEW ARTICLE

The Therapeutic Impact of Team Sports on Adolescent Anxiety Reduction: A Systematic Review

[1]Tolulope Olayiwola-Adedoja*, [1]Shantha Naidoo

[1]The EduHright Unit, Faculty of Education, Northwest University, Potchefstroom Campus, South Africa.
***. Corresponding Author: Tolulope Olayiwola-Adedoja**; **E-mail:** 55445047@mynwu.ac.za

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ABSTRACT

Background. Team sports participation offers adolescents physical, psychological, and social benefits. It can reduce Anxiety by promoting social connections, teamwork, and self-esteem. While individual studies suggest team sports can alleviate Anxiety, a comprehensive review is needed to consolidate these findings. **Objectives.** This study's objective was to systematically review the benefits of adolescent participation in team sporting activities, offering insights into its effects on anxiety reduction. **Methods.** Adhering to PRISMA guidelines, an extensive search across three bibliographic databases, PubMed, PsycINFO, and Scopus, identified 859 academic papers from January 2019 to June 2024. A validity assessment was conducted based on the research's findings and rigour. The review included 10 studies based on the inclusion criteria. Drawing on a range of studies, evidence suggests that participation in sporting activities can significantly reduce anxiety levels in adolescents, providing physical and psychological benefits. **Results.** Findings indicate that structured team sports are associated with significant anxiety reduction, particularly in sports like rugby and basketball that foster routines, peer support, and social engagement. General games provide moderate anxiety relief. Longer intervention duration and regular participation were correlated with sustained anxiety reduction. Gender influenced outcomes, with male adolescents reporting greater anxiety reductions. **Conclusion.** This review underscores team sports as an effective intervention for adolescent Anxiety by emphasising the value of structured, sustained engagement. Results support promoting inclusive, community-based sports programs to enhance mental health resilience among youth. Future studies should use standardised assessments and balanced gender representation to optimise the therapeutic benefits of team sports for adolescents' mental health.

INTRODUCTION

Adolescent mental health, especially Anxiety, is a growing global concern. This rise significantly impacts cognitive development, academic performance, and overall well-being. Studies indicate that 10-20% of adolescents worldwide face mental health issues for the first time (1). Estimates indicate that many adolescents in the UK have probable mental disorders (2). Furthermore, mental health disorders represent the leading burden of disease in this age group (3). Adolescents with Anxiety may struggle to form and maintain friendships, leading to social isolation and worsened anxiety symptoms.

Factors contributing to adolescents' Anxiety include academic pressure (4), nutrition (5), family issues, parental mental illness, poverty,

and violence (6). Adolescents facing adverse life events and poor relationships with parents are especially vulnerable to mental health issues (7). Those in low-resource settings risk poverty, community violence, and a lack of resources (8). Chronic Anxiety can result in physical symptoms like headaches and sleep problems. Untreated Anxiety can persist in adulthood, raising the risk of depression and substance abuse.

The prevalence of anxiety disorders among adolescents is significant, making it necessary to provide effective mental health services. Many adolescents with mental health disorders underutilise these services, compounded by low mental health literacy and limited knowledge of managing disorders (9). Interventions promoting adolescent mental health and prevention are crucial (10). Participation in sports is suggested as an effective strategy to reduce Anxiety and depression.

A study by Chi and Wang (11) indicated that sports participation offers avenues for physical activity and social interaction, effectively reducing anxiety symptoms. Studies like Quinlan et al. (8) and Xiao et al. (12) support this, demonstrating significant reductions in anxiety levels among adolescents who participate in sports. Physical activity improves performance and reduces high blood pressure, weight gain, strokes, and blood sugar levels (13-15). Murphy et al. (16) further highlight that sports participation correlates with greater well-being and lower anxiety and depression levels, with team sports enhancing the benefits.

Sports participation offers psychological benefits beyond anxiety reduction, especially for depression. Davies et al. (17) argue that community-level sports during adolescence can protect against depression and Anxiety, noting that team sport participation predicts fewer symptoms. Biese et al. (18) found that adolescents involved in team sports after adverse childhood events experience better outcomes than non-participants. Sports are crucial for mental health during crises like the COVID-19 pandemic, as studies show adolescents who continue sporting activities report lower anxiety and depression levels (19).

Sports participation can enhance resilience. Adolescent sports can improve body image and social Anxiety, promoting overall psychological well-being (20). Additionally, Tilindiene et al. (21) highlight that sports participation reduces Anxiety and lessens tendencies toward depression and hostility, underlining sports' significant impact on emotional health. This review aims to assess the therapeutic impact of participation in team sports (Intervention) compared to non-participation or alternative activities (Comparator) on anxiety reduction (Outcome) among adolescents aged 12–18 years (Population), based on evidence from observational and quasi-experimental studies (Study design). This research intends to answer questions on the demographic characteristics of adolescents participating in team sports, the types of team sports interventions being employed, and the frequency and duration of these interventions for adolescent anxiety reduction.

To deepen the theoretical foundation of this review, key psychological frameworks that explain the mechanisms through which team sports impact adolescent anxiety have been integrated. Notably, Self-Determination Theory (22) provides a robust lens for understanding how participation in team sports fulfills fundamental psychological needs, autonomy, competence, and relatedness that contribute to enhanced well-being and reduced Anxiety (23-25). Additional foundational studies and meta-analyses that explore motivation, social connectedness, and emotional regulation through physical activity have also been incorporated to contextualize how structured team sports foster resilience and psychological growth among adolescents (26-28).

In line with best practices and PRISMA guidelines, this review has actively sought out studies reporting null or negative findings related to the effects of team sports on adolescent Anxiety. While many studies highlight positive outcomes, a subset of research indicates no significant reduction or increased Anxiety due to competitive pressure or social dynamics within sports teams (29-31). Including these studies ensures a comprehensive and balanced overview, preventing publication bias and allowing for a more nuanced interpretation of how individual differences and contextual factors moderate the therapeutic benefits of team sports.

Overall, this balanced and theoretically grounded approach enriches the synthesis by acknowledging the complex interplay of motivational, social, and environmental factors in team sports interventions. It highlights the necessity for future research to identify which adolescents benefit most from team sports, under

what conditions, and how programs can be tailored to mitigate potential adverse effects. This comprehensive perspective strengthens the review's contribution to the field by providing more explicit guidance for practitioners, policymakers, and researchers aiming to optimize team sports as a tool for adolescent anxiety reduction.

MATERIALS AND METHODS

Search Strategy. A detailed search strategy was employed to conduct a comprehensive systematic literature review on participation in sporting activities. This review focused on its impact on reducing Anxiety among adolescents. The search was conducted across several prominent databases, including PubMed, PsycINFO, and Scopus. These databases were selected for their extensive medical, psychological, and interdisciplinary research coverage. The search terms used included keywords such as "adolescents," "anxiety," "sports," and "physical activity." Boolean operators (AND, OR) were used to refine the search and capture relevant articles—the search strategy aimed to identify all relevant studies published within the last five years. In total, 859 documents were found. A manual search of article reference lists was also performed. The search strings were arranged according to each database's specifications with the subject librarian's assistance, as indicated in Tables 1 and 2.

Table 1. PICOS framework.

Element	Description
Population (P)	Adolescents aged 10–19 years, from any geographical location, enrolled in school or community settings, with clinical or subclinical symptoms of Anxiety or at risk of anxiety disorders.
Intervention (1)	Participation in organized team sports (e.g., soccer, basketball, volleyball, rugby, netball, hockey, cricket), conducted in structured settings (school, community, club), with regular sessions (at least once weekly) and supervised by a coach or facilitator.
Comparison (C)	No intervention, waitlist control, standard physical education classes, individual sports participation, or other non-team-based activities (e.g., music, art, sedentary leisure).
Outcome (O)	Primary outcome: Reduced anxiety symptoms measured by validated tools (e.g., GAD-7, STAI, SCARED). Secondary outcomes: Improvements in social connectedness, self-esteem, resilience, or overall psychological well-being.
Study design	Randomized controlled trials (RCTs), quasi-experimental studies, longitudinal cohort studies, and pre–post intervention studies published in peer-reviewed journals.

Table 2. Search strings.

Search Query	Keywords in Title, Abstract, and Keyword
1	"team sport" OR "group sport" OR "organized sport" OR "competitive sport" OR "collective sport"
2	"adolescent" OR "teen" OR youth OR "young people"
3	"anxiety" OR "anxiety disorder" OR "social anxiety" OR "stress" OR "worry"
4	"therapy" OR "intervention" OR "treatment" OR "psychological benefit" OR "mental health improvement"

Databases: Web of Science, Scopus, APA PsycINFO, Eric, PubMed; Publication Dates: January 2019 to 2024.

Inclusion and Exclusion Criteria. This review applied inclusion and exclusion criteria guided by the PICOS framework to maintain methodological rigor. Studies were eligible for inclusion if they investigated the impact of organized team sports on adolescent anxiety reduction, utilizing validated psychological assessment instruments. Eligible designs included randomized controlled trials, quasi-experimental studies, and longitudinal cohort studies that reported pre- and post-intervention data. Only peer-reviewed articles published in English were considered for inclusion. Studies that examined unstructured recreational physical activities lacking a team component, or interventions unrelated to sport, such as art therapy, mindfulness training, or music programs, were excluded. Research involving populations outside the adolescent age range, studies without measurable anxiety outcomes, and those with mixed-age samples where adolescent-specific results could not be extracted were also excluded. Furthermore, non-empirical literature, including reviews, commentaries, and editorials, was not considered, as indicated in Table 3.

Table 3. Inclusion and exclusion criteria.

	Inclusion Criteria	Exclusion Criteria
Population	Studies focusing on adolescents aged 12-18 years	Studies focus on populations other than adolescents (e.g., children under 12 or adults over 18)
Intervention	Studies investigating participation in sporting activities, including individual and team sports	Studies involving non-sport-related physical activities (e.g., general physical activity, exercise programs not classified as sports)
Outcome	Studies measuring anxiety levels before and after participation in sporting activities using validated anxiety assessment tools	Studies that do not precisely measure anxiety levels or use non-validated tools to assess Anxiety
Study Design	Peer-reviewed articles, including randomised controlled trials (RCTs), cohort studies, case-control studies, and cross-sectional studies	Non-peer-reviewed articles, editorials, commentaries, reviews, and meta-analyses
Language	Studies published in English	Studies published in languages other than English
Publication Status	Published studies are available in full text.	Unpublished studies, conference abstracts, or studies without available full text

Selection Criteria and Outcome of Search. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) determined the screening criteria (13, 32-34). We conducted a literature review on interventions that have been designed to reduce Anxiety among adolescents or to manage it. The search was not limited to any location. In support of the exclusion criterion, the findings of the systematic literature review were not affected by the exclusion of dissertations (13, 32, 35). All articles were independently reviewed based on the three research questions raised. A comprehensive search using the terms "adolescents", "anxiety", "sports", and "physical activity" identified 859 records from three databases: 369 from Scopus, 210 from APA PsycINFO, and 280 from PubMed (see Figure 1).

Additional records were found through manual searches of reference lists. The PRISMA flow diagram in Figure 1 shows the details of the study selection process based on the predefined inclusion and exclusion criteria. In the first screening stage, 345 records were excluded for not meeting the inclusion criteria, including studies that were not original research articles (such as reviews, editorials, and commentaries), those published outside the specified time frame of January 2019 to June 2024, articles not published in English, or studies focusing on populations outside the adolescent age range of 12–18 years. From the remaining records, 268 were removed as duplicates or deemed irrelevant to the review focus, for example, studies investigating non-sport-related physical activities. This left 246 full-text articles to be assessed for eligibility. Of these, 182 were excluded because there was no access to the complete article or because the primary participants were not adolescents, with some studies involving children under 12 years or adults over 18 years. The remaining 64 articles underwent a more detailed eligibility assessment, excluding an additional 54 studies. The main reasons for exclusion at this stage included the absence of pre- and post-participation measures of Anxiety, the use of non-validated tools to assess Anxiety, interventions that did not involve sports (such as general physical activity or exercise programs), and the lack of quantitative results on anxiety reduction. Ultimately, 10 published and peer-reviewed studies met all the inclusion criteria and were included in the systematic review and analysis.

Quality Assessment and Data Synthesis. The methodological quality of the included studies was assessed using an adapted Joanna Briggs Institute (JBI) critical appraisal checklist, tailored for mixed study designs such as randomized controlled trials, quasi-experimental studies, surveys, cross-sectional research, and single-case designs. Seven appraisal criteria were applied: 1) clearly stated eligibility or inclusion criteria, 2) representative sampling or selection procedures, 3) intervention or exposure clearly described and measured reliably, 4) outcomes assessed using valid and reliable instruments, 5) identification and appropriate handling of confounders, 6) use of appropriate statistical analysis, and 7) adequate follow-up or completeness in line with the study design. Two reviewers independently evaluated all ten included studies, resolving disagreements through discussion and, when necessary, with the adjudication of a third reviewer. Inter-rater

reliability was 87.3%. Each criterion was rated as Yes, No, or Unclear, and studies were classified as having low risk of bias (6-7 items rated Yes), moderate risk (4-5 items rated Yes), or high risk (0-3 items rated Yes) as indicated in Tables 4 and 5.

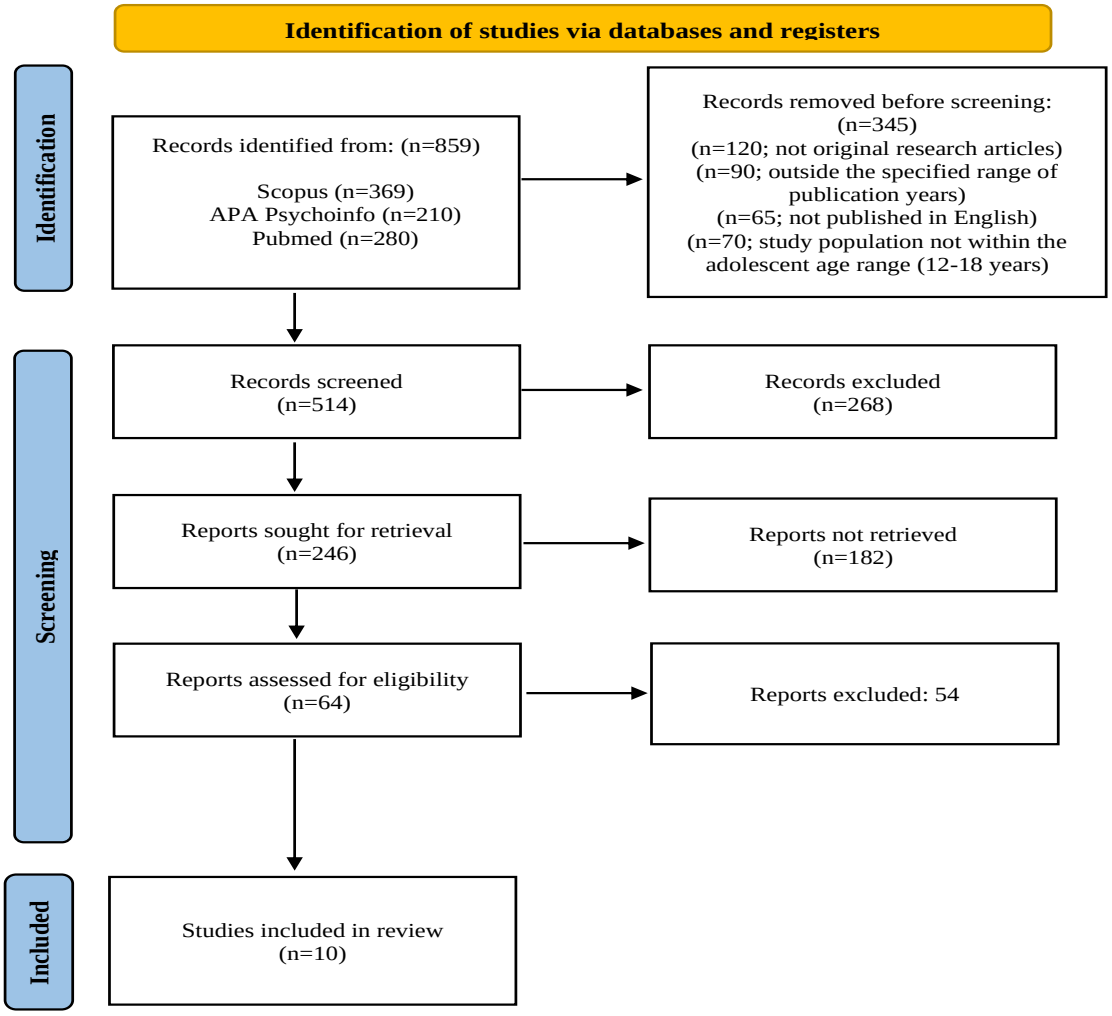

Figure 1. Flowchart of the systematic literature search.

Table 4. Risk of bias table.

Author (Year)	Selection Bias	Measurement Bias	Reporting Bias	Overall Risk of Bias
Waters et al. (2022) (36)	Low	Moderate	Low	Moderate
Bjerkan et al. (2022) (37)	Low	Low	Low	Low
Caze et al. (2020) (38)	Moderate	Moderate	Low	Moderate
Wang & Qian (2024) (39)	Low	Low	Low	Low
D'Alonzo et al. (2023) (40)	Low	Low	Low	Low
Kullik et al. (2024) (41)	Moderate	Moderate	Moderate	Moderate
Phrathep et al. (2023) (42)	Moderate	Moderate	Low	Moderate
de Lima Pinto et al. (2022) (43)	High	High	Moderate	High
Olive et al. (2021) (44)	Low	Moderate	Moderate	Moderate
Zeller et al. (2024) (45)	Low	Low	Low	Low

Table 5. Quality appraisal table.

Author (Year)	Study design	Sample Size	Strengths	Limitation
Waters et al. (2022) (36)	Non-randomised	251	Community-based design; validated tools	No female participants; moderate bias
Bjerkan et al. (2022) (37)	Survey	7347	Large sample; validated checklist	Cross-sectional; self-report bias
Caze et al. (2020) (38)	Survey	52	Targeted concussion-related Anxiety	Small sample; no control group
Wang & Qian (2024) (39)	Survey	60498	Massive dataset; rigorous statistical methods	Non-experimental; no intervention tested
D'Alonzo et al (2023) (40)	RCT	54	RCT design; anxiety-specific measures	Small sample; male-only
Kullik et al (2024) (41)	Quasi-experimental	332	Multiple instruments; clear analysis	Female-only; short duration
Phrathep et al (2023) (42)	Experimental	1	Tailored intervention; symptom tracking	Single subject; low generalizability
De Lima Pinto et al (2022) (43)	Quasi-experimental	10	Sport-specific measures; short-term effect	Short duration; no follow-up
Olive et al. (2021) (44)	Survey	10	Wide demographic; para-athlete comparison	Mostly self-reported data
Zeller et al. (2024) (45)	Cross-sectional study	1566	Large female sample; specialization focus	Cross-sectional; no causality

Overall Quality of Evidence. Among the ten studies, two were rated as low risk of bias, five as moderate, and three as high risk. Studies at lower risk typically employed large, representative samples and well-validated anxiety measures, though many were cross-sectional, limiting causal inference. Moderate-risk studies often had small or gender-restricted samples, brief intervention durations, or insufficient control for confounding variables. Small samples, lack of control groups, and minimal follow-up marked high-risk studies. Common methodological weaknesses across the evidence base included reliance on self-reported outcomes, lack of blinding, incomplete reporting of recruitment procedures, and inadequate adjustment for potential confounders. These limitations were considered when interpreting the findings, with higher-risk studies being weighed less in the synthesis as indicated in Table 6.

Quality and Consistency of Interventions. The interventions reviewed across the included studies demonstrate varied quality and consistency in their designs, methods, and execution. Most interventions employed validated anxiety assessment tools and rigorous analysis methods, such as mixed factorial ANOVA, survival analysis, and regression techniques, ensuring robust evaluation of outcomes. The quality of study designs ranged from randomized controlled trials and quasi-experimental approaches to large-scale surveys and cross-sectional studies, reflecting a spectrum of methodological rigor. Intervention durations varied widely, from as short as two days to extended periods like two years, indicating inconsistency in exposure length. Intervention agents included researchers, psychologists, sports medicine physicians, and team officials, highlighting a multidisciplinary delivery approach. However, participant characteristics such as gender representation and age ranges occasionally limited generalizability, with some studies focusing exclusively on males or females. While several studies reported significant improvements in Anxiety and related mental health outcomes, others showed more nuanced or no significant effects, suggesting variability in intervention impact. Overall, the interventions reflect moderate quality with some methodological strengths but inconsistent durations and participant demographics, pointing to a need for more standardized, comprehensive approaches in future research.

Potential Mechanisms of Action (Biopsychosocial pathways). The interventions seem to reduce Anxiety through interconnected biopsychosocial pathways. Biologically, team sports can regulate physiological stress responses, improve mood, and ease somatic anxiety symptoms. Psychologically, structured sporting activities promote emotional regulation, better sleep, and mood stability. Socially, involvement in group sports fosters a sense of belonging,

strengthens social support, and helps shape identity. These mechanisms likely work together, although their effects may differ depending on the intervention design and participant characteristics.

Limitations of Included Studies. Frequent limitations included small or gender-specific samples, short intervention periods without follow-up, lack of control groups, and reliance on self-report measures. Certain studies excluded female participants entirely, and others used cross-sectional designs that limited causal interpretation. Despite these issues, strengths included large sample sizes in some studies, widespread use of validated instruments, and methodological diversity, providing multiple perspectives.

Justification for Narrative Synthesis. A meta-analysis was not conducted due to substantial heterogeneity in study design, intervention type, duration, outcome measures, and reporting formats. The included studies varied in methodological frameworks, anxiety measurement tools, intervention agents, and statistical reporting, making pooled effect-size estimation inappropriate. Instead, a narrative synthesis was undertaken to capture the complexity and contextual nuances of the evidence.

Table 6. Methodological quality assessment of included studies (adapted JBI checklist).

Study (Year)	Clear eligibility criteria	Representative sampling	Intervention/exposure described & measured reliably	Outcomes measured with valid/reliable tools	Confounders identified & addressed	Appropriate statistical analysis	Adequate follow-up/completeness	Overall risk of bias
Waters (2022) (36)	Yes	Yes	Yes	Yes	No	Yes	Yes	Moderate
Bjerkan (2022) (37)	Yes	Yes	Yes	Yes	No	Yes	Yes	Low–Moderate
Caze (2020) (38)	Yes	No	Yes	Yes	No	Yes	No	Moderate
Wang & Qian (2024) (39)	Yes	Yes	Unclear	Yes	No	Yes	Unclear	Low–Moderate
D'Alonzo et al. (2023) (40)	Yes	Yes	Yes	Yes	No	Yes	Yes	Moderate
Kullik et al. (2024) (41)	Yes	Yes	Yes	Yes	No	Yes	Yes	Moderate
Phrathep et al. (2023) (42)	Yes	No	Yes	Yes	No	Yes	No	High
de Lima Pinto et al. (2022) (43)	Yes	No	Yes	Yes	No	Yes	No	High
Olive et al. (2021) (44)	Yes	Yes	Unclear	Yes	No	Yes	Unclear	Moderate
Zeller et al. (2024) (45)	Yes	Yes	Yes	Yes	No	Yes	Yes	Low

RESULTS

Table 7 indicates different study designs across the included research studies, suggesting a rich methodological diversity in investigating psychological and physical interventions.

Study Designs Used. The most common designs used in these studies are survey and quasi-experimental, employing three studies each. Specifically, some studies employed the survey research design, which accounted for approximately 33.3% of the total designs (37-39). Similarly, "quasi-experimental" was adopted by Kullik et al. (41) and Phrathep et al. (42), making up about 33.3% of the total. The "non-randomised community-matched design" was the least used design, specified in the studies of Waters et al. (36) and D'Alonzo et al. (40).

Instrumentation. The studies collectively employed a broad array of instruments, with no single one appearing more than once. This illustrates a high level of variability in measurement tools across studies. The study by Waters et al. (36) features the most instruments, listing four different ones. In contrast, studies such as Caze et al. (38) and Wang and Qian (39) used only two types of instruments for data collection, indicating the least amount of instrument variety.

Method of Analysis. A wide range of analytical methods was used across studies. Two studies, Bjerkan et al. (37) and Phrathep et al. (42), featured descriptive statistics indicating their widespread usage. However, no single method is significantly more prevalent than the others. Wang and Qian (39) employed three distinct methods of analysis (Pearson Product-Moment Correlation, Descriptive Statistics, and Mediation Analysis), representing the study with the most diverse analytical approaches.

Intervention Agents. The studies introduce various intervention agents, including sports medicine physicians, researchers, parents, and professional organisations. Waters et al. (36) highlight a collaborative approach involving the National Rugby League (NRL), parents, and researchers, while many other studies, such as Bjerkan et al. (37), reference only a single agent, reflecting a lack of diversity. The recurring theme of 'researchers' emphasises their significant role across different experiments.

The analysis offers an overview of diverse methodological approaches, measurement tools, and strategies for exploring psychological and physical well-being interventions in various settings. It underscores contemporary research's complexity and versatility when developing effective interventions.

Table 8 examines sports and demographics across various studies, offering helpful information regarding research encompassing eight distinct sports: rugby, gym activities, general games, aerobic exercise, athletic training, basketball, athletes, and softball athletes. "Athlete" and "General game" represent the most frequently cited categories, appearing in two studies each (Caze et al. (38) and Wang & Qian (39) for General game; Kullik et al. (41) and Phrathep et al. (42) for Athlete). General games are the most utilised sport, as highlighted in previous studies for their inclusiveness (38, 39). Conversely, only one study references rugby, aerobic exercise, and basketball, indicating a more specialised interest. Participant ages range from 10 to over 17 years, with mean ages varying from 13.12 in Waters et al. (36) to 24.5 in Olive et al. (44). The total number of participants is 70584, indicating a significant gender disparity: 65652 males (93%) compared to 36068 females (51%). This disparity may stem from biological differences in anxiety management and societal expectations influencing the coping strategies of boys and girls. Male adolescents tend to engage more in team sports, which correlates with anxiety reduction through physical exercise. The coping strategies boys and girls exhibit differ; boys often express emotions through physical activity, whereas girls typically depend on social support, which may not provide immediate relief. Perceptions of sports competence significantly affect anxiety reduction, with boys generally demonstrating higher confidence levels. This trend is particularly evident in a study by Wang and Qian (39), which reports the highest male participation (29,863, or 50% of all males). In contrast, Phrathep et al. (42) included only one male participant, while Wang and Qian (39) recorded the highest female participation at 30635. Studies by Waters et al. (36), Phrathep et al. (42), and De Limma Pinto et al. (43) reported no female participation, indicating the lowest levels recorded.

Table 7. Study design method of analysis and intervention agents.

Authors and year	Design	Instrument	Method of Analysis	Intervention Agents
Waters et al. (2022) (36)	non-randomized community-matched design	The RCADS-25 Depression Subscale. Strengths and Difficulties Questionnaire (SDQ). Multidimensional Students' Life Satisfaction Scale. Gratitude Questionnaire (GC-6)	Mixed Factorial ANOVA	National Rugby League (NRL), Parents and Researchers
Bjerkan et al. (2022) (37)	Survey	Hopkins Symptom Checklist	Descriptive Statistics, t-tests & Multinomial regression	Norwegian University of Science and Technology (NTNU) Researcher
Caze et al. (2020) (38)	Survey	Graded Symptom Checklist, AS Index-3 (ASI-3)	Grow Curve Modeling technique	sports medicine physicians and researchers
Wang & Qian (2024) (39)	Survey	Test Anxiety Scale (STQM04203) & Social and Emotional Skills Scale (SSES)	Pearson Product-Moment Correlation, Descriptive Statistics & Mediation Analysis	Researchers and the OECD
D'Alonzo et al. (2023) (40)	Randomised experimental trial	Post-Concussion Symptom Inventory (PCSI) & pre-injury PROMIS Anxiety	Survival Analysis and logistic regression	Researchers and the American Medical Society for Sports Medicine.
Kullik et al. (2024) (41)	Quasi-experimental	Depression Anxiety Stress Scales (DASS-21). The Pittsburgh Sleep Quality Index (PSQI) and the Athletes' Sleep Behavior Questionnaire (ASBQ)	Multiple Linear Regression	Researchers
Phrathep et al. (2023) (42)	Multiple-baseline experimental design	Symptoms Check-List-90-Revised (SCL-90-R), Sport Interference Checklist (SIC) & Beck Depression Inventory-II (BDI-II)	Descriptive and Chi-Square	Psychologist
de Lima Pinto et al. (2022) (43)	Quasi-experimental design	Competitive State Anxiety Inventory-2 (CSAI-2), Total Quality of Recovery (TQR) scale, and Brunel Mood Scale (BRUMS)	Repeated measures ANOVA	Football Club officials
Olive et al. (2021) (44)	Survey	General Help Seeking Questionnaire, General Health Questionnaire (GHQ-28), Eating Disorders Examination Questionnaire (EDE-Q), and Alcohol Use Disorders Test	Logistic regression & 2-Way Analysis of Variance	AIS's Athlete Well-being and Engagement team,
Zeller et al. (2024) (45)	Cross-sectional Survey	patient health questionnaire-9 (PHQ-9), general anxiety disorder scale (GAD-7)	ANOVA and T-test	Sport Official

Table 9 illustrates the duration of team sport interventions across studies. Interventions varied from 2 days for basketball (43) to 2 years for gyms and physical activities (37). Most studies reported moderate durations of 4 weeks (40), 6 months (36), and 12 months (44). This variation indicates that both short- and long-term interventions can effectively address Anxiety in adolescents, with optimal duration potentially varying by context and individual needs.

Table 8. Nature of sport and participant demographic characteristics.

Authors and year	Type of Sport	Age	Gender
Waters et al. (2022) (36)	Rugby	(12-15 yrs) (Mean = 13.12 yrs)	Male=251 Female=0 Total=251
Bjerkan et al. (2022) (37)	Gyms and physical activities	13–19 yrs	Male=3522 Female=3825 Total=7347
Caze et al. (2020) (38)	General game	13–18 yrs	Male=26 Female=26 Total=52
Wang and Qian (2024) (39)	General game	10 & 15 yrs	Male=29863 Female=30635 Total=60498
D'Alonzo et al. (2023) (40)	Aerobic exercise	13-18 yrs	Male=54, Female=0 Total=54
Kullik et al. (2024) (41)	Exercise and Athlete	20-29 yrs (Mean = 23.13)	Male=0 Female=322 Total=322
Phrathep et al. (2023) (42)	Athlete	12-17 yrs (Mean = 14 yrs)	Male=1 Female=0 Total=1
de Lima Pinto et al. (2022) (43)	Basketball	13-17 yrs (Mean = 14.8 yrs)	Male=10 Female=0 Total=10
Olive et al. (2021) (44)	Athlete	17 yrs and above (Mean = 24.5 yrs)	Male=822, Female=744, Total=1566
Zeller et al. (2024) (45)	Softball Athlete	12-18 yrs (Mean = 15.1 yrs)	Male=0 Female=1283 Total=1283

Table 9. Duration of team sport interventions.

Authors and year	Team Sport Intervention	Duration
Waters et al. (2022) (36)	Rugby	6 months
Bjerkan et al. (2022) (37)	Gyms and physical activities	2 years
Caze et al. (2020) (38)	General game	16 Months
Wang and Qian (2024) (39)	General game	Not Specified
D'Alonzo et al. (2023) (40)	Aerobic exercise	4 weeks
Kullik et al. (2024) (41)	Exercise and Athlete	2 Months
Phrathep et al. (2023) (42)	Athlete	7 months
de Lima Pinto et al. (2022) (43)	Basketball	2 days
Olive et al. (2021) (44)	Athlete	12 Months
Zeller et al. (2024) (45)	Softball Athlete	8 Months

Cumulative Findings. Table 10 reveals insights into physical activity, sports participation, and mental health across populations. It uncovers the benefits of an active lifestyle and the impact of specific conditions and interventions. The literature review highlights a link between sports participation and reduced Anxiety among adolescents, exploring this relationship's implications for mental health. Key themes from the studies show the benefits of sports participation, focusing on diversity in sports demographics and the importance of mental health assessment in sports settings.

Theme 1: Diversity in Sports and Participant Demographics. The diversity in sports disciplines across eight unique sports with varying participant demographics highlights a broad interest and opportunity to study the psychological impact of sports. This variety spans from team sports like rugby and basketball to individual physical activities such as aerobic exercises and gym workouts. The significant variance in participant demographics, age, and gender distribution indicates a comprehensive approach to understanding the inclusive nature of sports.

Table 10. Findings.

Authors and year	Duration	Results
Waters et al. (2022) (36)	6 months	Mental health measures, high-risk RISE players' depression, and behavioural problems improved from pre-to post-program relative to no change among Comparison players
Bjerkan et al. (2022) (37)	2 years	Adolescents with a low activity level had a higher probability of experiencing symptoms of Anxiety and depression than adolescents with a high activity level.
Caze et al. (2020) (38)	16 Months	Concussed adolescents with higher Anxiety Sensitivity scores reported more initial symptoms than those reporting musculoskeletal injury.
Wang & Qian (2024) (39)	Not Specified	Sports participation alleviates test anxiety and acts as a regulator, moderating the extent of this alleviation.
D'Alonzo et al. (2023) (40)	4 weeks	Over time, the PROMIS Anxiety score was significantly associated with an elevated PCSI score.
Kullik et al. (2024) (41)	2 Months	Menstrual symptom Index score demonstrated a highly significant ($p<0.001$) positive association with Depression, Anxiety, Stress, PSQI, and ASBQ.
Phrathep et al. (2023) (42)	7 months	The severity of concurrent symptoms associated with Social Anxiety Disorder and Agoraphobia Symptoms, and factors interfering with sports performance, improved from pre- to post-intervention
de Lima Pinto et al. (2022) (43)	2 days	The mood profile was significantly modified during the competition, and the anger subscale was different pre- and post-match, with somatic Anxiety decreased in match 3 compared to match 1
Olive et al. (2021) (44)	12 Months	No significant differences were observed between athletes from para- and non-para-sports on most mental health symptoms, except alcohol consumption.
Zeller et al. (2024) (45)	8 Months	Lower scores were reported on both the PHQ-9 and GAD-7 by highly specialised athletes compared with moderate or low-specialization athletes.

For example, the "General game" category, highlighted in the studies by Caze et al. (38) and Wang and Qian (39), suggests a broad appeal and accessibility of these activities. In contrast, sports like rugby and basketball, noted in singular studies, point to more niche research areas, possibly reflecting specific cultural or community interests. The distinct age groups, with the youngest participants in the study by Waters et al. (36) and the oldest in Kullik et al. (41), further underscore the broad appeal of sports across life stages.

Theme 2: Mental Health Assessment and Intervention. Mental health's role in sports is evident through various research designs and tools. Waters et al. (36) used a non-random design with the RCADS-25 Depression Subscale and the Strengths and Difficulties Questionnaire to assess rugby players' psychological outcomes. Similarly, Kullik et al. (41) used the DASS-21 in a quasi-experimental setup to examine exercise's effect on 20-29-year-olds' mental health, highlighting increased awareness in active communities.

Intervention agents, including sports medicine physicians and the OECD, emphasise a collaborative approach to mental health in sports, underscoring the need for interdisciplinary cooperation to enhance athletes' psychological welfare. Although methodologies like surveys and randomised trials differ, both studies investigate the psychological impacts of sports participation.

Research by Bjerkan et al. (37) found that adolescents who engaged in physical activity experienced significantly fewer Anxiety and depression symptoms than less active peers, indicating regular activity's protective effects against mood disorders. In addition, Wang and Qian (39) demonstrated that sports participation helps reduce test anxiety, aiding students and young adults in coping with academic stress.

The intervention evaluated by Phrathep et al. (42) highlights physical activity's positive impact, reducing symptoms of Social Anxiety Disorder and Agoraphobia through a structured 7-month programme. Improved symptom severity and athletic performance reflect the dual benefits of these initiatives. Nevertheless, diversity among sports and demographics presents challenges and opportunities, necessitating tailored interventions for various ages, genders, or sport groups.

The thematic analysis of studies reveals a complex connection between physical activity and psychological well-being. Despite varying sports disciplines and participant backgrounds, a consistent emphasis on mental health underscores its growing significance in sports. These findings

offer crucial insights for policymakers and practitioners to create more inclusive and supportive environments for athletes and sports participants.

DISCUSSION

Research shows that adolescents who participate in sports experience less Anxiety. Physical activity alleviates Anxiety, with team sports offering greater benefits through social interaction. Davies et al. (17) and Zeller et al. (45) support that sports participation combats Anxiety and depression, enhancing emotional well-being. Additionally, sports improve physical health, as highlighted by Kim and Yi (14) and Taylor (15), who report lower blood pressure, weight gain, strokes, and blood sugar levels in active adolescents. The connection between better physical health and lower Anxiety illustrates the holistic benefits of sports.

Davies et al. (19) link sports participation to decreased depression and increased adolescent happiness. Research indicates that sports enhance resilience, which is crucial for coping with challenges like the COVID-19 pandemic, suggesting that sporting activities foster mental toughness and overall well-being. The literature consistently highlights the advantages of participating in sports for the community and society. Mokitimi et al. (3) noted that team sports improve outcomes for adolescents facing Anxiety and enrich social networks, helping to reduce potential isolation.

Studies agree on the mental health benefits of sports for adolescents but vary in mechanisms. Some focus on physiological benefits, while others emphasise psychosocial advantages of team involvement (25, 26). Sports participation supports adolescents' mental and physical health, offering a promising approach to reducing Anxiety and enhancing well-being (27). Waters et al. (36) noted improvements in depression and behaviour among high-risk rise players after six months. Wang and Qian (39) found that sports participation reduces test anxiety and suggests a regulatory aspect.

Bjerkan et al. (37) found that less active adolescents face higher risks for Anxiety and depression, which emphasises the value of regular physical activity. Caze et al. (38) revealed that concussed adolescents with high anxiety sensitivity show more severe symptoms than peers with muscle injuries. This conclusion is supported by Zeller et al. (45), who report significant links between health scores and heightened psychological distress, stressing the interplay of physical and mental health.

Interventions and competitive environments are crucial in shaping mental health outcomes. De Lima Pinto et al. (43) found that targeted interventions improved Social Anxiety Disorder symptoms. Kullik et al. (41) studied athletes' mood fluctuations during competitions, documenting mood changes and decreased somatic Anxiety, illustrating the transient effects of competitive stressors. Studies by Kullik et al. (41) and Olive et al. (44) further show how athlete specialisation impacts mental health, with Beenen et al. (29) noting no significant differences in most mental health symptoms between para- and non-para-sports athletes, apart from alcohol consumption, raising debate about universal athlete challenges.

In contrast, Olive et al. (44) found that highly specialised athletes report lower Anxiety and depression, suggesting benefits from rigorous training. Overall, findings indicate a complex relationship between physical activity and mental health, advocating for a nuanced view of how sports can both protect against and function as therapy for mental health issues, influenced by health conditions, interventions, and training environments. These insights inform practices in sports psychology, mental health interventions, and further research on optimising well-being for athletes and the public.

Limitations of the Study. The following points explain the reasons for the study's limitations.

Reliance on Self-Reported Anxiety Levels: Many studies rely on self-reported anxiety measures, which can introduce biases. Social desirability bias may cause participants to underreport or overreport their Anxiety. Additionally, subjective interpretations of Anxiety vary among individuals, leading to data inconsistencies.

Lack of Longitudinal Studies: The review likely emphasises cross-sectional studies, which capture data at one time, limiting causal relationship assessment and understanding the long-term efficacy of team sports for Anxiety. Longitudinal studies can reveal how participation affects Anxiety over time, offering insights into sustained benefits or fluctuations.

Sample Size and Diversity: The included studies may have insufficiently large or diverse

sample sizes for generalising findings across populations. Smaller, homogenous samples can skew results, not accurately reflecting broader adolescent demographics. Discussing this limitation highlights the need for research considering factors like ethnicity and socioeconomic status.

Variability in Intervention: Different team sports implementations across studies can complicate comparisons. Factors such as sport type, competition level, coaching styles, and team dynamics affect outcomes. Acknowledging this variability clarifies that results may not be universally applicable.

Potential Confounding Variables: External factors, like family support, peer relationships, and pre-existing mental health conditions, may not be adequately controlled. These variables can impact anxiety levels independently of team sports participation, casting doubt on the findings' specificity.

Publication Bias: The review should consider publication bias, where studies with positive results are more likely to be published than those with null or negative findings. This bias can distort the understanding of team sports' effectiveness in reducing Anxiety, necessitating careful interpretation of results.

CONCLUSION

The literature consistently demonstrates a significant positive association between sports participation and reduced Anxiety among adolescents, with regular engagement promoting both physical health and mental well-being. Vulnerable youths, in particular, benefit from reduced Anxiety, enhanced self-esteem, and greater resilience through individual and team sports, while also gaining from the social interaction and community cohesion that participation fosters. Given persistent barriers to accessing mental health services, sports can serve as an important public health strategy; however, further research is needed to clarify whether individual or team sports are more effective for different subgroups, considering personality traits, social preferences, and anxiety profiles. Longitudinal studies are especially crucial to determine whether the benefits observed in cross-sectional research are sustained or evolve across developmental stages. Additionally, with advances in digital technology, innovative approaches such as mobile applications, online coaching, and virtual team sports hold potential to expand access, particularly for adolescents unable to engage in traditional settings, and warrant investigation to inform the design of inclusive, technology-enhanced programmes that promote adolescent mental health.

APPLICABLE REMARKS

- Sporting activities that foster routines, peer support, and social engagement are associated with anxiety reduction.
- Sustained anxiety reduction is linked to regular and sustained sporting participation.
- Gender differences significantly impact anxiety reduction.
- This study recommends promoting inclusive, community-based sports programs to enhance mental health resilience among youth.

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AUTHORS' CONTRIBUTIONS

Study concept and design: Tolulope Olayiwola-Adedoja. Acquisition of data: Tolulope Olayiwola-Adedoja. Analysis and interpretation of data: Tolulope Olayiwola-Adedoja. Drafting the manuscript: Tolulope Olayiwola-Adedoja. Critical revision of the manuscript for important intellectual content: Shantha Naidoo. Statistical analysis: Shantha Naidoo. Administrative, technical, and material support: Shantha Naidoo. Study supervision: Shantha Naidoo.

CONFLICT OF INTEREST

The authors reported no potential conflicts of interest.

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The authors declare that they have no financial interests or relationships that could influence the content or outcomes of this study. No financial conflicts of interest are associated with this research.

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ROLE OF THE SPONSOR

The sponsor had no role in the study design, data collection, data analysis, interpretation of results, manuscript preparation, or decision to submit the article for publication.

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Artificial intelligence tools were not used in this manuscript's conceptualization, data analysis, or writing, except for general-purpose language models employed for proofreading or editing, such as ChatGPT and Grammarly. These tools were only used for language editing and phrasing, and the author(s) reviewed all content and remain responsible for the final manuscript.

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