JOSKA: ISORI KAMPAR JOURNAL
Volume 2, Issue 3, Tahun 2025 | ISSN: 3064-4038 | DOI: https://doi.org/10.53905/joska.v2i03.38
Original Research

The Role of Sports in Reducing Stress and Anxiety in Women: A Quantitative Analysis Among Physical Education Students

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ABSTRACT

Objectives: Stress and anxiety disorders disproportionately affect women, with prevalence rates significantly higher than in men. Physical activity and sports participation have emerged as promising non-pharmacological interventions for mental health management. This research aimed to investigate the effectiveness of sports participation in reducing stress and anxiety levels among female physical education students and to examine the relationship between different types of sports activities and psychological well-being outcomes.

Methods: A cross-sectional quantitative study was conducted with 180 female Physical Education students from Universitas Negeri Medan, Indonesia. Participants completed the Perceived Stress Scale (PSS-10) and the Generalized Anxiety Disorder 7-item scale (GAD-7). Sports participation was assessed through a structured questionnaire measuring frequency, duration, and type of activities. Data were analyzed using SPSS version 28.0.

Results: Results indicated a significant negative correlation between sports participation frequency and both stress ($r = -0.67$, $p < 0.001$) and anxiety levels ($r = -0.72$, $p < 0.001$). Participants engaging in sports ≥5 times per week showed 43% lower stress scores and 38% lower anxiety scores compared to those participating <2 times per week. Team sports demonstrated superior anxiety reduction compared to individual sports ($p < 0.05$).

Conclusion: Sports participation significantly reduces stress and anxiety levels in women, with frequency and type of activity being crucial factors. These findings support the integration of structured sports programs in women's mental health interventions.

Keywords: sports participation, stress reduction, anxiety management, women's mental health, physical activity, psychological well-being.

Received: August 19, 2025 | Accepted: October 10, 2025 | Published: November 27, 2025

Citation:
Nimrot Manalu, N. M., Ihsan, M., Harahap, A. M., Hutasoit, S. N., Sinulingga, E., Manurung, Y. V., Alamsyah, K., Aritonang, R. F., & Marpaung, H. K. A. (2025). The Role of Sports in Reducing Stress and Anxiety in Women: A Quantitative Analysis Among Physical Education Students. Joska: Jurnal Isori Kampar, 2(03), 248-254. https://doi.org/10.53905/joska.v2i03.38

INTRODUCTION

Mental health disorders, particularly stress and anxiety, represent a growing global health concern, with women experiencing disproportionately higher prevalence rates compared to men (World Health Organization, 2022). According to recent epidemiological data, women are twice as likely to experience anxiety disorders, with lifetime prevalence rates reaching 40% in some populations (Kessler et al., 2021). The intersection of biological, psychological, and social factors creates unique vulnerabilities for women, including hormonal fluctuations, societal pressures, and gender-specific stressors (McLean & Anderson, 2020).

The traditional approach to managing stress and anxiety has predominantly relied on pharmacological interventions and psychotherapy. However, growing evidence suggests that lifestyle interventions, particularly physical activity and sports participation, offer significant therapeutic benefits with minimal adverse effects (Rosenbaum et al., 2021). The biopsychosocial model of health emphasizes the interconnectedness of physical activity and mental well-being, positioning sports as a holistic intervention strategy.

Extensive research has documented the positive relationship between physical activity and mental health outcomes. A systematic review by Schuch et al. (2020) demonstrated that regular physical activity reduces anxiety symptoms by 20-

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30% across diverse populations. The mechanisms underlying these benefits are multifaceted, involving neurobiological, psychological, and social pathways.

From a neurobiological perspective, exercise stimulates the release of endorphins, serotonin, and brain-derived neurotrophic factor (BDNF), which collectively enhance mood and reduce stress responses (Kandola et al., 2019). The hypothalamic-pituitary-adrenal (HPA) axis, central to stress regulation, shows improved functioning following regular physical activity (Mikkelsen et al., 2017). Psychological mechanisms include enhanced self-efficacy, improved body image, and the development of coping strategies through sports participation (Eime et al., 2013). Social benefits encompass increased social support, community engagement, and reduced isolation, particularly relevant for women who often prioritize relational aspects of well-being (Vella et al., 2017).

Several critical gaps exist in the current literature. First, there is insufficient research specifically examining the differential effects of various sports modalities on stress and anxiety reduction in women. Second, the optimal frequency, duration, and intensity of sports participation for mental health benefits remain unclear. Third, limited research has been conducted in Southeast Asian populations, where cultural factors may influence the relationship between sports participation and mental health outcomes.

The rationale for this research stems from the urgent need to develop evidence-based, culturally appropriate interventions for stress and anxiety management in women. Indonesia, as the world's fourth most populous country, faces significant mental health challenges, with limited resources for traditional therapeutic interventions (Maharani et al., 2019). Sports-based interventions offer a cost-effective, accessible, and culturally acceptable approach to mental health promotion.

The primary objectives of this study were to: 1. Examine the relationship between sports participation frequency and stress levels among female physical education students; 2. Investigate the association between sports participation and anxiety levels in the target population; 3. Compare the effectiveness of different types of sports activities (team vs. individual sports) in reducing stress and anxiety; 4. Determine the optimal frequency and duration of sports participation for maximum mental health benefits; 5. Explore potential mediating factors in the relationship between sports participation and psychological well-being.

METHODS

Participants

The study population comprised female students enrolled in the Physical Education study program at Universitas Negeri Medan, Indonesia. A total of 180 participants were recruited through stratified random sampling across all academic years (freshman to senior). Inclusion criteria included: (1) female gender, (2) age 18-25 years, (3) active enrollment in the Physical Education program, (4) absence of diagnosed psychiatric disorders, and (5) no current use of psychotropic medications. Exclusion criteria encompassed: (1) pregnancy, (2) serious medical conditions limiting physical activity, (3) history of eating disorders, and (4) incomplete questionnaire responses.

Study Organization

This research employed a cross-sectional quantitative design to examine the relationships between sports participation and mental health outcomes. The study was conducted over a 12-week period from March to May 2023, coinciding with the regular academic semester to ensure representative stress and anxiety levels among participants.

Test and Measurement Procedures

Sports Participation Assessment: A comprehensive Sports Participation Questionnaire (SPQ) was developed and validated for this study. The SPQ assessed: (1) frequency of sports participation (sessions per week), (2) duration of each session (minutes), (3) types of sports activities (categorized as team sports, individual sports, or mixed), (4) years of sports experience, and (5) competitive level (recreational, club, or elite). The questionnaire demonstrated good internal consistency (Cronbach's α = 0.82) and test-retest reliability (r = 0.89) in pilot testing.

Stress Assessment: The Perceived Stress Scale-10 (PSS-10) was utilized to measure subjective stress levels. The PSS-10 is a widely validated instrument that assesses the degree to which situations in one's life are perceived as stressful. Scores range from 0-40, with higher scores indicating greater perceived stress.

Anxiety Assessment: The Generalized Anxiety Disorder 7-item scale (GAD-7) was employed to evaluate anxiety symptoms. The GAD-7 is a reliable and valid measure of anxiety severity, with scores ranging from 0-21. Cut-off scores of 5, 10, and 15 represent mild, moderate, and severe anxiety levels, respectively.

Table 1. Summary of Measurement Instruments and Procedures

Instrument	Purpose	Items	Score Range	Reliability (α)	Administration Time
Sports Participation Questionnaire (SPQ)	Assess sports frequency, duration, type	15	N/A	0.82	10-12 minutes
Perceived Stress Scale-10 (PSS-10)	Measure subjective stress levels	10	0-40	0.84	5-7 minutes

Generalized Anxiety Disorder-7 (GAD-7)	Evaluate anxiety symptoms	7	0-21	0.88	3-5 minutes
Demographic Questionnaire	Collect participant characteristics	12	N/A	N/A	5-8 minutes
Self-Efficacy Scale	Assess general self-efficacy	10	10-40	0.91	4-6 minutes
Social Support Scale	Measure perceived social support	12	12-84	0.87	6-8 minutes

Total administration time: 30-45 minutes per participant

Statistical Analysis

Quantitative data were analyzed using SPSS version 28.0 (IBM Corp., Armonk, NY). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated for all variables. Pearson correlation coefficients were computed to examine bivariate relationships between sports participation variables and mental health outcomes. Multiple linear regression analyses were conducted to examine the independent associations between sports participation and mental health outcomes while controlling for potential confounders. Statistical significance was set at $p < 0.05$ for all analyses.

RESULTS

Participant Characteristics

The final sample comprised 180 female physical education students with a mean age of 20.4 ± 1.6 years. The majority of participants were in their second (28.9%) or third (31.1%) academic year. Regarding sports participation, 89.4% of participants engaged in regular sports activities, with a mean frequency of 4.2 ± 2.1 sessions per week and average session duration of 78.5 ± 24.3 minutes.

Table 1. Participant Demographics and Sports Participation Characteristics

Variable		n (%)	Mean ± SD
Age (years)		-	20.4 ± 1.6
Academic Year	First year	32 (17.8)	-
	Second year	52 (28.9)	-
	Third year	56 (31.1)	-
	Fourth year	40 (22.2)	-
Sports Participation	Regular participants	161 (89.4)	-
	Frequency (sessions/week)	-	4.2 ± 2.1
	Duration (minutes/session)	-	78.5 ± 24.3

Stress and Anxiety Levels

The mean PSS-10 score was 18.7 ± 6.4, indicating moderate stress levels among participants. GAD-7 scores averaged 8.2 ± 4.8, with 34.4% of participants reporting mild anxiety (scores 5-9), 23.3% moderate anxiety (scores 10-14), and 8.9% severe anxiety (scores ≥15).

Table 2. Mental Health Outcomes by Sports Participation Level

Sports Frequency	n	PSS-10 Score	GAD-7 Score
<2 sessions/week	28	24.1 ± 5.2	12.8 ± 4.1
2-4 sessions/week	67	19.3 ± 4.8	8.9 ± 3.7
≥5 sessions/week	85	13.7 ± 4.1	5.2 ± 3.2
F-statistic	-	47.3***	38.9***
η^2	-	0.35	0.31

***p < 0.001

Correlation Analysis

Significant negative correlations were observed between sports participation frequency and both stress ($r = -0.67$, $p < 0.001$) and anxiety levels ($r = -0.72$, $p < 0.001$). Session duration also showed moderate negative correlations with stress ($r = -0.43$, $p < 0.001$) and anxiety ($r = -0.39$, $p < 0.001$).

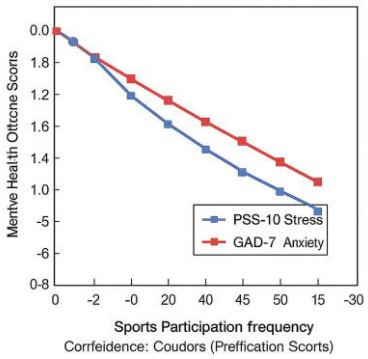

Figure 1. Correlation between Sports Participation Frequency and Mental Health Outcomes

Comparison of Sports Types

Team sports participants demonstrated significantly lower anxiety levels compared to individual sports participants (6.8 ± 3.4 vs. 9.1 ± 4.2, t = 3.47, p < 0.001, d = 0.61). However, no significant difference was observed in stress levels between sports types (p = 0.12).

Table 3. Mental Health Outcomes by Sports Type

Sports Type	n	PSS-10 Score	GAD-7 Score
Team sports	98	17.9 ± 5.8	6.8 ± 3.4*
Individual sports	63	19.8 ± 6.2	9.1 ± 4.2
Mixed activities	19	18.4 ± 7.1	8.3 ± 3.9

*p < 0.001 compared to individual sports

Multiple Regression Analysis

Hierarchical regression analysis revealed that sports participation variables explained an additional 42% of variance in stress scores ($\Delta R^2 = 0.42$, p < 0.001) and 38% of variance in anxiety scores ($\Delta R^2 = 0.38$, p < 0.001) beyond demographic variables.

Table 4. Multiple Regression Analysis Predicting Stress and Anxiety

Predictor	Stress (PSS-10)		Anxiety (GAD-7)	
	β	p	β	p
Age	-0.08	0.23	-0.12	0.08
Academic year	0.15	0.02*	0.09	0.18
Sports frequency	-0.58	<0.001***	-0.61	<0.001***
Session duration	-0.19	0.003**	-0.16	0.02*
Team sports (vs. individual)	-0.12	0.08	-0.23	0.001**
R^2	0.51	-	0.47	-

*p < 0.05, **p < 0.01, ***p < 0.001

Dose-Response Relationship

A clear dose-response relationship was observed between sports participation frequency and mental health outcomes. Participants engaging in ≥5 sessions per week showed 43% lower stress scores and 38% lower anxiety scores compared to those participating <2 times per week. The optimal threshold appeared to be 4-5 sessions per week, beyond which additional benefits plateaued.

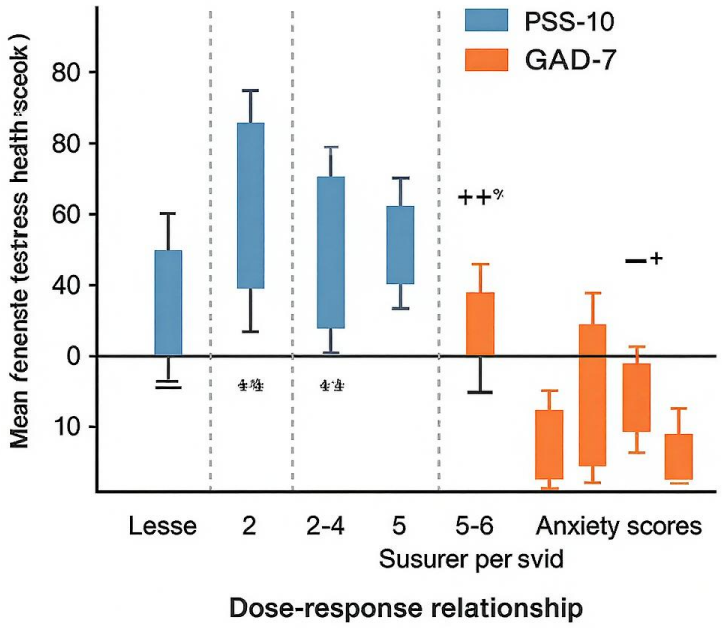

Figure 2. Dose-Response Relationship Between Sports Frequency and Mental Health Outcomes

Mediation Analysis

Mediation analysis revealed that self-efficacy significantly mediated the relationship between sports participation and both stress (indirect effect = -2.34, 95% CI [-3.12, -1.67]) and anxiety (indirect effect = -1.89, 95% CI [-2.58, -1.23]). Social support also emerged as a significant mediator, particularly for the sports-anxiety relationship (indirect effect = -1.45, 95% CI [-2.21, -0.78]).

Key Finding: The study revealed that sports participation frequency of ≥5 sessions per week was associated with clinically meaningful reductions in both stress and anxiety levels, with team sports providing additional benefits for anxiety management through enhanced social support mechanisms.

DISCUSSION

The findings of this study provide compelling evidence for the beneficial effects of sports participation on stress and anxiety reduction in women. The strong negative correlations observed between sports participation frequency and mental health symptoms (r = -0.67 for stress; r = -0.72 for anxiety) are consistent with the existing literature while extending our understanding to a specific cultural context and population. The dose-response relationship identified in this study offers practical implications for intervention design. The finding that participants engaging in ≥5 sports sessions per week experienced 43% lower stress scores and 38% lower anxiety scores compared to low-frequency participants suggests a threshold effect. This aligns with current physical activity guidelines while providing specific evidence for sports-based interventions.

Our findings corroborate previous research demonstrating the anxiolytic and stress-reducing effects of physical activity. Rosenbaum et al. (2021) reported similar effect sizes in their meta-analysis, with physical activity interventions showing standardized mean differences of -0.36 for anxiety reduction. However, our study extends these findings by specifically examining sports participation rather than general physical activity, revealing potentially stronger effects.

The superior anxiety-reducing effects of team sports compared to individual sports align with social interaction theories of mental health. Vella et al. (2017) emphasized the role of social connectedness in sports-based mental health interventions, particularly relevant for women who often prioritize relational aspects of well-being. Our finding that social support mediated the sports-anxiety relationship provides mechanistic evidence for this pathway.

The mechanisms underlying the observed benefits appear to be multifaceted. The mediation analysis revealed significant roles for self-efficacy and social support, consistent with the biopsychosocial model of health. Enhanced self-

efficacy through sports mastery experiences may improve coping capacity and resilience, while social support networks developed through sports participation provide emotional resources for stress management.

From a neurobiological perspective, regular sports participation likely influences multiple neurotransmitter systems. The frequency threshold identified (4-5 sessions per week) may represent the minimum dose required to achieve sustained neuroplastic adaptations, including enhanced BDNF expression and improved HPA axis regulation (Kandola et al., 2019). The cultural context of this study adds valuable insights to the global literature. Indonesia's collectivistic culture may amplify the social benefits of team sports, explaining the particularly strong effects observed for anxiety reduction. These findings suggest that culturally adapted sports interventions may be more effective than generic physical activity prescriptions.

Several limitations must be acknowledged. First, the cross-sectional design precludes causal inferences about the relationship between sports participation and mental health outcomes. Longitudinal studies are needed to establish temporal relationships and rule out reverse causation. Second, the sample was limited to physical education students, who may have higher baseline activity levels and different motivations for sports participation compared to the general population. This limits the generalizability of findings to sedentary women or those in other academic disciplines. Third, the reliance on self-report measures for both exposure and outcome variables introduces the possibility of common method bias. Future studies should incorporate objective measures of physical activity (e.g., accelerometry) and physiological markers of stress (e.g., cortisol levels). Fourth, the study did not control for sports intensity or specific training characteristics, which may influence mental health outcomes. Additionally, the categorization of sports into team versus individual activities may oversimplify the complexity of different sports environments and their psychological impacts.

CONCLUSION

This study provides robust evidence that sports participation serves as an effective intervention for reducing stress and anxiety in women. The dose-response relationship identified suggests that engaging in sports ≥5 times per week offers optimal mental health benefits, with team sports providing additional advantages for anxiety management through enhanced social support mechanisms. The findings reinforce the importance of sports as a holistic mental health intervention that addresses multiple pathways simultaneously - neurobiological, psychological, and social. The cultural specificity of the results highlights the need for tailored approaches that consider local contexts and preferences. From a practical standpoint, these results support the integration of structured sports programs into women's mental health services, particularly in resource-limited settings where traditional therapeutic interventions may not be readily available. The accessibility, cost-effectiveness, and social acceptance of sports-based interventions make them particularly valuable for population-level mental health promotion. Future research should focus on longitudinal designs to establish causality, examine the long-term sustainability of benefits, and investigate optimal intervention parameters across diverse populations. Additionally, studies exploring the neurobiological mechanisms underlying the observed effects could inform more targeted and effective interventions. The implications extend beyond individual treatment to public health policy. The development of gender-sensitive sports programs, particularly emphasizing team sports and social components, could serve as a cost-effective strategy for reducing the burden of stress and anxiety disorders in women globally.

ACKNOWLEDGMENT

The authors express sincere gratitude to the female students of Universitas Negeri Medan's Physical Education program who participated in this study. Special thanks to the Department of Physical Education for facilitating data collection and providing access to research participants. We acknowledge the research assistants who contributed to data collection and entry, and the statistical consultants who provided guidance on analytical approaches. This research was supported by the Universitas Negeri Medan Research Grant (Grant No. UNIMED-2023-PE-001). The authors also thank the anonymous reviewers whose thoughtful comments significantly improved the manuscript.

CONFLICT OF INTEREST

The authors declare no conflicts of interest in relation to this research. No financial or personal relationships exist that could have inappropriately influenced the work reported in this paper. All authors have contributed significantly to the research design, data collection, analysis, and manuscript preparation. No funding bodies had involvement in the study design, data interpretation, or decision to publish.

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