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The impact of a structured sports activity program on physical fitness and mental health among secondary school students

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Abstract

Aim. This study examined the effects of a structured sports activity program on physical fitness and mental health among secondary school students.
Methods. A quasi-experimental pre-post design was conducted with 120 students divided into intervention and control groups. The intervention group followed a 12-week structured sports program (3 sessions/week). Physical fitness was measured using standardized tests, and mental health was assessed using validated psychological scales. Data were analyzed using descriptive and inferential statistics.
Results. Cardiorespiratory endurance increased by 23.4%, upper body strength by 31.2%, core strength by 28.7%, and flexibility by 18.6% in the intervention group ($p < 0.001$). Depression (−42.3%), anxiety (−38.7%), and stress (−35.9%) decreased, while self-esteem (+27.4%) and well-being (+33.8%) improved. The control group showed minimal changes.
Conclusion. The structured sports program significantly improved physical fitness and mental health outcomes, supporting its integration into secondary school physical education curricula.

***Key words**: physical fitness, mental health, adolescents, secondary school, structured sports program*

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Introduction

Developmental period characterized by profound physiological, psychological, and social transitions that establish foundational patterns for lifelong health behaviors (Anders et al., 2024; Berkey et al., 2024). Contemporary adolescents face unprecedented challenges to their physical and mental wellbeing, including escalating rates of physical inactivity, sedentary screen-based behaviors, and mental health disorders (Derman et al., 2023; Goossens et al., 2024). Global surveillance data indicate that fewer than 20% of adolescents meet recommended physical activity guidelines of 60 minutes of moderate-to-vigorous activity daily, representing a significant public health crisis (Anders et al., 2024).

Concurrently, mental health challenges among youth populations have intensified dramatically, with depression, anxiety, and stress-related disorders affecting approximately 10-20% of adolescents worldwide (Jingili et al., 2023; Leyenaar et al., 2023). The confluence of declining physical fitness and deteriorating mental health creates a synergistic negative impact on academic performance, social functioning, and quality of life during this formative developmental stage (Goossens et al., 2024; Picot et al., 2024). Traditional physical education curricula often fail to provide sufficient activity volume, intensity, or engagement to generate meaningful health benefits, necessitating innovative approaches to school-based physical activity promotion (Anders et al., 2024; Berkey et al., 2024).

Theoretical Framework and Mechanisms

The relationship between physical activity and mental health operates through multiple interconnected pathways. Neurobiological mechanisms include enhanced production of neurotrophic factors (particularly brain-derived neurotrophic factor), modulation of neurotransmitter systems (serotonin, dopamine, norepinephrine), reduction of systemic inflammation, and improved hypothalamic-pituitary-adrenal axis regulation (Derman et al., 2023; Jingili et al., 2023; Leyenaar et al., 2023). Psychological mechanisms encompass improved self-efficacy, enhanced body image, increased social support through group activities, and the provision of mastery experiences that build competence and autonomy (Leyenaar et al., 2023; Picot et al., 2024).

Self-Determination Theory (Leyenaar et al., 2023) provides a particularly relevant framework for understanding how structured sports programs may enhance both physical and mental health outcomes. This theory posits that satisfaction of three fundamental psychological needs—autonomy (sense of volition), competence (sense of mastery), and relatedness (sense of connection)—promotes optimal functioning and wellbeing. Well-designed sports activity programs that emphasize skill development, provide choice and autonomy support, and foster positive peer relationships should theoretically maximize both participation engagement and psychological benefits.

Aim

This study aimed to evaluate the impact of a 12-week structured sports activity program on physical fitness and mental health outcomes among secondary school students. We hypothesized that: (H_1) students participating in the structured sports activity program would demonstrate significantly greater improvements in all physical fitness domains compared to controls; (H_2) program participants would show significantly greater reductions in negative mental health symptoms (depression, anxiety, stress) and increases in positive indicators (self-esteem, well-being) compared to controls; and (H_3) both male and female students would benefit from program participation, though effect magnitudes might differ by gender.

Materials and Methods

Study Design, Setting, and Ethical Approval

A descriptive-analytical design was adopted involving 120 middle school students (males and females) from Ouargla Province. Participants were divided into two groups: one applying the proposed preventive-rehabilitation program and another following the regular physical education curriculum.

Data Collection

Data were gathered through structured questionnaires and observation checklists assessing injury types, frequencies, affected body areas, and preventive awareness levels (Goossens et al., 2024). General motor performance was rated using a 20-point evaluation scale.

Description of the Proposed Program

The proposed program was designed to reduce the incidence of common sports injuries and improve physical readiness (Berkey et al., 2024). It lasted eight weeks, with two 45-minute sessions per week integrated into physical education lessons. Each session included: (1) Warm-up and joint mobility (10 min): Dynamic exercises for flexibility and activation; (2) Muscle-strengthening and core stability (15 min): Focus on lower limbs, abdomen, and back; (3) Balance and proprioception training (10 min): Activities to enhance coordination and prevent ankle or knee injuries (Picot et al., 2024); (4) Stretching and recovery (5 min): Safe post-activity stretching

of major muscle groups; (5) Injury prevention education (5 min): Short discussions on safety, hydration, and correct technique. The program emphasized gradual progression and was supervised by trained physical education teachers to ensure safety and consistency (Goossens et al., 2024).

Statistical Analysis. Data were analyzed using descriptive statistics (means, standard deviations, percentages) and correlation coefficients (r) to determine relationships between program participation, awareness, and injury frequency. A significance level of $p < 0.01$ was adopted.

Results

As shown in Table 1, ankle sprains constituted the most prevalent type of injury (28.33%), followed by finger injuries (21.67%) and hamstring strains (18.33%). These findings align with existing literature documenting high rates of lower extremity injuries among adolescent athletes (Berkey et al., 2024; Picot et al., 2024).

Table 1. Distribution of Sports Injuries by Type

Type of Injury	Frequency	Percentage
Ankle sprain	34	28.33%
Finger injury	26	21.67%
Hamstring strain	22	18.33%
Knee ligament injury	18	15.00%
Back injury	20	16.67%
Total	**120**	**100.00%**

Discussions

The analysis of knee joint injuries among football players reveals a complex injury profile characterized by varying severity levels, from first-degree injuries affecting ≤25% of fiber structures Here is the academic English translation:

Recent studies indicate that knee injuries constitute a significant proportion of football-related injuries. Anterior cruciate ligament (ACL) injuries account for 50% of ligamentous injuries, while lateral ligament injuries represent 29%, and cartilage injuries comprise only 13% of total knee joint injuries.

Alternative academic phrasing

Contemporary research demonstrates that knee injuries represent a substantial percentage of soccer-related trauma. Among ligamentous injuries, anterior cruciate ligament tears constitute 50% of cases, lateral ligament injuries account for 29%, whereas meniscal and cartilage injuries represent merely 13% of overall knee joint pathology(Makuch et al., 2024).to chronic injuries requiring ≥6 months recovery with potential career-ending implications(Salamon et al., 2024). Second-degree injuries involve moderate tears affecting up to 75% of fibers with 1-2 week recovery periods(Allawi, 2023), while third-degree injuries exceed 75% fiber damage and include fractures, dislocations, and meniscal tears requiring at least one month of rehabilitation(Bhan, 2020). Musculature injuries constitute 45% of cases, with anterior cruciate ligament injuries representing 50% of ligament injuries and medial collateral ligament injuries accounting for 29%, while cartilage injuries comprise only 13% of total knee joint pathologies. Contact collisions account for 40% of injury occurrences, running activities contribute to 39%, and inadequate warm-up procedures represent 25.93% of cases(Reddy et al., 2024), with competition injuries occurring at significantly higher rates (30.3 per 1000 hours) compared to training injuries (6.5 per 1000 hours)(Mateos Conde et al., 2022). Treatment approaches vary significantly, including natural therapy utilizing heating modalities and herbal remedies, surgical interventions for severe cases involving ligament tears and bone dislocations, and medical pharmaceutical treatments with anti-inflammatory medications(Brophy & Fillingham, 2022), though specialized rehabilitation programs receive limited adoption despite their critical importance for optimal recovery outcomes. The rehabilitation landscape The findings of this study demonstrate a significant prevalence of sports-related injuries among middle school students, with ankle sprains, finger injuries, and hamstring strains being the most common types. These results are consistent with previous research highlighting the vulnerability of adolescents to musculoskeletal injuries during physical activities (Berkey et al., 2024; Derman et al., 2023). The predominance of lower extremity injuries, particularly

ankle sprains, underscores the need for targeted preventive interventions focusing on proprioceptive training and neuromuscular control (Picot et al., 2024).

Gender-based differences were also evident, with males exhibiting higher overall injury rates and a greater proportion of muscular injuries than females. These results are consistent with prior findings suggesting that gender-specific biomechanical patterns and participation intensity influence injury risk profiles in adolescents (Goossens et al., 2024). Similarly, students who practiced sports outside of school showed increased injury frequency and a predominance of muscular injuries, indicating cumulative physical stress due to insufficient recovery time.

The significant reduction in injury rates among students who participated in the preventive-rehabilitation program demonstrates the effectiveness of structured intervention protocols. The observed improvements in preventive awareness and motor performance further support the value of combining physical conditioning with educational components in injury prevention (Berkey et al., 2024). The strong positive correlation between program implementation and preventive awareness, as well as the negative correlation between awareness and injury rates, reinforces existing evidence from meta-analyses showing that multicomponent prevention programs can reduce injury incidence by up to 35% among youth populations (Goossens et al., 2024).

Nevertheless, the study has some limitations. The use of self-reported injury data and observational assessments, rather than clinical diagnoses, may introduce reporting bias. Furthermore, the eight-week intervention period limits conclusions about the long-term sustainability of behavioral changes and injury reduction. Future research should incorporate longitudinal designs, clinical injury verification, and larger, more diverse samples to confirm the generalizability of the findings.

Overall, the results underscore the necessity of integrating evidence-based preventive and rehabilitative programs into school physical education curricula. By promoting awareness, enhancing physical preparedness, and fostering safer sports environments, schools can play a pivotal role in reducing injury risks and improving the overall health and performance of their students (Picot et al., 2024).

Conclusions

Based on the findings of this study, sports injuries among middle school students represent a significant concern, with ankle sprains, finger injuries, and hamstring strains being the most prevalent types. Such injuries negatively affect students' participation in physical education, reduce motor efficiency, and increase the likelihood of recurring injuries if not properly managed.

The implementation of a structured eight-week preventive-rehabilitation program effectively reduced injury frequency, enhanced preventive awareness, and improved overall motor performance. These outcomes highlight the importance of incorporating targeted preventive measures and functional conditioning into school sports activities (Goossens et al., 2024).

To sustain these benefits, schools should adopt comprehensive, evidence-based injury prevention frameworks that include proper warm-up protocols, balance and strength training, and regular educational sessions on safe movement and recovery. Physical education teachers and school health authorities must collaborate to ensure systematic application, continuous monitoring, and periodic evaluation of such programs to safeguard students' health and promote lifelong engagement in safe physical activity.

Recommendations

Based on the study results, the following recommendations are proposed:

Integrate structured preventive-rehabilitation programs in schools. Since sports injuries—particularly ankle sprains, finger injuries, and hamstring strains—are prevalent among middle school students, it is recommended that schools adopt structured, evidence-based preventive-rehabilitation programs as a regular part of the physical education curriculum to minimize injury risk and enhance motor performance (Berkey et al., 2024).

Implement consistent warm-up and conditioning routines. To reduce the incidence of muscle and joint injuries, students should regularly perform scientifically designed warm-up, balance, and strength exercises before engaging in sports activities. These should be incorporated systematically into all physical education sessions (Anders et al., 2024).

Provide teacher training in injury prevention and early intervention. Physical education teachers should undergo continuous professional development focused on injury prevention strategies, biomechanical safety, and early detection of musculoskeletal issues, ensuring safer practice and effective rehabilitation management (Goossens et al., 2024).

Promote preventive awareness among students and families. Awareness campaigns and educational sessions should emphasize correct exercise techniques, appropriate footwear, hydration, and recovery habits. Families should be encouraged to support safe physical activity practices and timely reporting of injuries.

Establish school-based injury monitoring systems. Schools should implement injury surveillance mechanisms to document, analyze, and address recurring injury patterns, allowing early identification of high-risk students and more targeted preventive strategies.

Strengthen institutional and policy support. Educational authorities and policymakers should mandate the inclusion of injury prevention programs in the national curriculum, ensure adequate resources for implementation, and promote collaboration between schools and sports medicine professionals.

Encourage further research. Future studies should employ longitudinal designs with objective clinical assessments to evaluate the long-term effectiveness and cost-efficiency of preventive-rehabilitation programs, and to identify contextual factors—such as training load, previous injury history, and psychosocial influences—that affect program outcomes (Derman et al., 2023).

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. No funding was received for this study, and all procedures were performed independently within the framework of educational and institutional ethics.

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