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THE IMPACT OF VOLLEYBALL AND PHYSICAL ACTIVITY ON GAIT AND POSTURE IN SCHOOL-AGE CHILDREN

Denis Nuriu [1]***, Junida Pogoni*** [2]

[1] Department of Physical Activity and Health, Institute of Sports Scientific Research, University of Sports in Tirana

[2] Department of Movement and Health, Faculty of Physical Activity and Recreation, University of Sports in Tirana University of Sports in Tirana

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Abstract

This study explores the impact of volleyball participation and general physical activity on gait and posture development in school-age children. A four-month intervention involving 206 participants aged 8–15 was conducted in five Albanian cities. Children were divided into two matched groups: one engaged in structured volleyball training, while the other followed a non-volleyball physical activity program. Assessments of stride length, symmetry, cadence, and postural stability were conducted pre- and post-intervention. The results showed statistically significant improvements in all parameters, with the volleyball group demonstrating greater gains in stride length (15%), limb symmetry (12%), and postural stability (18%). Pearson correlation analysis confirmed a strong positive relationship between volleyball participation and motor development improvements. These findings highlight the potential of integrating volleyball into school curricula to promote healthy physical development and prevent postural abnormalities in children.

Keywords: *Volleyball, physical activity, gait, posture, school-age children, motor development, postural stability*

I. Introduction

The development of optimal gait and posture is crucial during childhood, as it influences overall physical health and functional abilities. Physical activity, including organized sports such as volleyball, holds promise for enhancing these aspects of motor development in school-age children. However, comprehensive investigations into the specific impact of volleyball on gait and posture remain limited.

This study aims to examine the effects of volleyball participation and general physical activity on gait parameters and posture alignment in a cohort of school-age children.

Incorporating volleyball into physical education curricula or extracurricular programs may offer valuable opportunities for

promoting healthy motor development and mitigating postural abnormalities in school-age children.0

II. Literature Review

Gait refers to the manner in which an individual walks, while posture describes the alignment and positioning of the body (Levine, D., Richards, J., & Whittle, M. W., 2012). Physical activity encompasses any bodily movement produced by skeletal muscles that results in energy expenditure.

Proper gait and posture are essential for children's overall physical health and development. They facilitate efficient movement, reduce the risk of musculoskeletal injuries, and contribute to improved balance and coordination.

Several studies have investigated the relationship between physical activity and motor development in children. Stodden et al. (2008) proposed a developmental perspective on the role of motor skill competence in physical activity, suggesting an emergent relationship. Goodway et al. (n.d.) emphasized the importance of motor development in young children and its impact on physical activity.

While previous studies have explored the general relationship between physical activity and motor development, specific investigations into the impact of volleyball on gait and posture in school-age children are limited.

III. Methodology

This intervention study employed a pre-post design to assess the effects of a four-month exercise intervention on gait parameters and posture alignment in school-age children. The study was conducted in five cities in Albania. A total of 206 children, aged 8 to 15, participated in the study. They were divided into two groups: a volleyball group (n=103) and a non-volleyball group (n=103). The groups were matched for age, gender, and baseline gait and posture measures.

All participants underwent thorough assessments of gait parameters and posture alignment before and after the four-month intervention period. Gait and postural parameters were assessed using instrumented analysis, including:

- Stride length;
- Symmetry between lower limbs;
- Cadence;
- Postural stability (balance test).

The children walked barefoot at a self-selected speed on a five-meter walkway, turning around and returning twice. For four months, all children actively participated in the intervention physical program:

- Volleyball group: Regular volleyball training sessions;
- Non-volleyball group: Specific exercises to improve gait and posture.

The volleyball training sessions focused on:

- Strength training (e.g., good mornings, single leg RDLs, dumbbell squat to press);
- Agility and plyometric drills (e.g., box jumps, lateral lunges with press, side shuffles);
- Flexibility and mobility work (e.g., walking lunges, planks, core exercises);
- Dynamic movement drills (e.g., volleyball-specific sprints, medicine ball slams);
- Postural control exercises (e.g., heel raised squats, crawl and glutes stretches).

The non-volleyball group engaged in similar exercises tailored to improve gait and posture.

Descriptive statistics summarized participant characteristics. Paired t-tests compared pre- and post-intervention measures within each group. Independent t-tests assessed differences in changes between the volleyball and non-volleyball groups. Pearson correlation analysis evaluated the relationship between volleyball participation and improvements in gait and posture.

This intervention study utilized a pre-post design to examine the effects of a four-month volleyball program and general physical activity on gait parameters and posture alignment in school-age children. The volleyball training sessions incorporated strength, agility, flexibility, and dynamic exercises targeting motor skill development. Gait and postural stability were assessed using instrumented analysis before and after the intervention period. Statistical analyses compared outcomes between the volleyball and non-volleyball groups.

IV. Results

A total of 206 school-age children participated in the study, with 103 children in the

volleyball group and 103 in the non-volleyball group. The participants were aged between 8 to 15 years, with a mean age of 11.5 years (SD = 2.1). The demographic characteristics of the participants are summarized in Table 1.

Table 1.

Characteristic	Volleyball Group (n=103)	Non-Volleyball Group (n=103)	Total (n=206)
Age (years)	11.6 (2.0)	11.4 (2.2)	11.5 (2.1)
Gender (M/F)	55/48	52/51	107/99

Both groups showed significant improvements in gait parameters following the four-month intervention. The results of the gait analysis are presented in Table 2, which details the pre- and post-intervention measurements for stride length, symmetry, and cadence.

Table 2.

Gait Parameter	Volleyball Group (n=103)	Non-Volleyball Group (n=103)	p-value
Stride Length (cm)	Pre: 120.5 (10.3) Post: 138.5 (11.4)	Pre: 118.0 (9.8) Post: 128.0 (10.1)	<0.001
Symmetry (%)	Pre: 85.0 (5.5) Post: 95.0 (4.8)	Pre: 84.0 (6.0) Post: 90.0 (5.0)	<0.001
Cadence (steps/min)	Pre: 110.0 (12.0) Post: 115.0 (11.5)	Pre: 108.0 (10.5) Post: 110.0 (10.0)	0.045

Postural stability was assessed using a balance test, and the results are summarized in Table 3. The volleyball group exhibited a significant enhancement in postural stability compared to the non-volleyball group.

Table 3.

Postural Stability Measure	Volleyball Group (n=103)	Non-Volleyball Group (n=103)	p-value
Stability Index (cm)	Pre: 4.5 (1.2) Post: 3.0 (0.8)	Pre: 4.7 (1.0) Post: 4.2 (1.1)	<0.001

Key Findings

- The volleyball group demonstrated a **15% increase in stride length** and a **12% improvement in symmetry** between lower limbs compared to the non-volleyball group;
- The increase in cadence was statistically significant for both groups, but the volleyball group showed a greater improvement.

Table 4.

Variable	Correlation Coefficient (r)	p-value
Volleyball Participation vs. Stride Length Improvement	0.68	<0.001
Volleyball Participation vs. Symmetry Improvement	0.62	<0.001

Variable	Correlation Coefficient (r)	p-value
Volleyball Participation vs. Postural Stability Improvement	0.72	<0.001

A Pearson correlation analysis was conducted to evaluate the relationship between participation in volleyball and improvements in gait and posture. The results are presented in Table 4.

Key Findings:

- There was a significant positive correlation between volleyball participation and improvements in stride length (r = 0.68), symmetry (r = 0.62), and postural stability (r = 0.72), suggesting that increased engagement in volleyball is associated with enhanced gait and posture parameters.

The results of this study indicate that participation in volleyball significantly improves gait parameters and posture alignment in school-age children. The volleyball group exhibited greater enhancements in stride length, symmetry, and postural stability compared to the non-volleyball group, highlighting the benefits of organized sports in promoting healthy motor development. The findings underscore the importance of incorporating volleyball and similar physical activities into school curricula to foster optimal physical health in children.

V. Discussion

The findings highlight the positive influence of volleyball participation and regular physical activity on gait and posture development in school-age children. The greater improvements observed in the volleyball group suggest that organized sports may provide additional benefits beyond general physical activity.The study's findings have important implications for promoting healthy motor development in school-age children. Incorporating volleyball into physical education curricula or extracurricular programs may help mitigate postural abnormalities and enhance overall physical health.

The results of this study are consistent with previous research demonstrating the positive relationship between physical activity and motor development in children (Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., & Garcia, L. E., 2008; Goodway, J. D., Ozmun, J. C., & Gallahue, D. L. (n.d.)). However, this study provides novel insights into the specific impact of volleyball on gait and posture.

The study's limitations include its relatively short intervention period and the lack of long-term follow-up data. Additionally, the study did not assess the potential influence of other factors, such as socioeconomic status or family physical activity levels, on the observed outcomes.

VI. Conclusion

This study investigated the impact of volleyball participation and general physical activity on gait parameters and posture alignment in school-age children. The key findings are summarized as follows:

- **Improvements in Gait Parameters:** Children who participated in volleyball exhibited a **15% increase in stride length** and a **12% improvement in symmetry** between lower limbs compared to the non-volleyball group. These enhancements indicate that volleyball training significantly contributes to better walking mechanics;
- **Enhancement in Postural Stability:** The volleyball group demonstrated an **18% improvement in postural stability**, highlighting the positive effects of volleyball on balance and overall posture. In contrast, the non-volleyball group showed more modest improvements;
- **Correlation with Participation:** A significant positive correlation was found between volleyball participation and improvements in both gait and posture parameters, with correlation coefficients of **0.68 for stride length**, **0.62 for symmetry**, and **0.72 for postural stability**. This suggests that increased engagement

in volleyball is associated with enhanced motor development;

The findings of this study have several important implications for the promotion of physical activity among school-age children:

Integration of Volleyball in Physical Education: Given the significant improvements in gait and posture associated with volleyball participation, schools should consider incorporating volleyball into their physical education curricula. This could not only enhance motor skills but also foster a lifelong interest in physical activity.

Promotion of Organized Sports: The study underscores the importance of organized sports, like volleyball, in developing essential motor skills and physical fitness in children. Encouraging participation in such activities can lead to healthier lifestyles and better physical health outcomes.

Addressing Postural Abnormalities: The positive impact of volleyball on postural stability suggests that participation in this sport may help mitigate postural abnormalities among children, which can have long-term benefits for their overall musculoskeletal health.

While this study provides valuable insights, several areas warrant further investigation:

Longitudinal Studies: Future research should focus on longitudinal studies to assess the long-term effects of volleyball participation on gait and posture. Understanding how these improvements are maintained over time would provide deeper insights into the benefits of sustained physical activity.

Diverse Populations: Expanding the research to include diverse populations, including children with varying physical abilities or those from different socioeconomic backgrounds, could enhance the generalizability of the findings.

Comparative Studies: Conducting comparative studies between volleyball and other sports or physical activities could help identify specific elements of volleyball training that are most effective in improving gait and posture.

Mechanisms of Improvement: Further research should explore the underlying mechanisms that contribute to the observed improvements in gait and posture due to volleyball participation. Understanding these mechanisms can inform the design of targeted interventions for motor development.

The findings of this study suggest that incorporating volleyball into physical education curricula or extracurricular programs can offer valuable opportunities for promoting healthy motor development in school-age children. Schools and community organizations should prioritize organized sports like volleyball to foster physical fitness, improve motor skills, and enhance overall health in children.In conclusion, this study highlights the significant positive influence of volleyball participation and regular physical activity on gait and posture development in school-age children. By promoting such activities, we can contribute to healthier, more active lifestyles for future generations.

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Contact: dnuriu@ust.edu.al