LONGITUDINAL EFFECTS OF A TRADITIONAL VOLLEYBALL TRAINING ON MOTOR SKILLS DEVELOPMENT IN EARLY ADOLESCENTS

Enkeleda Muka[1], Vera Antonova[2], Hristo Andonov[2]
[1]Sports University of Tirana, Albania
[2]National Sports Academy "Vassil Levski", Sofia, Bulgaria

ABSTRACT
The coaches aim to develop an adequate training methodology that integrates technical and physical training to maximize the potential of sports performance, age-appropriately. Through the applied methodology, volleyball coaches focus on achieving parallel development as a symbiotic relationship between technical and motor training in young children. Objective: This study aims to identify the effectiveness of a volleyball training program in developing the motor skills of volleyball players aged 11-13 years. Methodology: Twenty female volleyball players aged 11-13 participated in this study. A battery of 8 tests of physical performance was selected to assess the level of their motor skills. The athletes were tested twice, at the beginning and end of the experimental training phase, to assess the level of development and achievement in motor skills indicators. The athletes underwent a traditional volleyball training program with a frequency of three times per week for one year. A paired sample t-test was used to compare the indicators of motor skills performance before and after the one-year experimental training phase. Results: The results show significant changes ($p < .05$) in the variables over time for all specified pairs of physical performance. Discussion: The results show that the typology of volleyball training significantly affects children's motor skills development, realizing the importance and positive impact of volleyball training on the overall development of children aged 11-13. Conclusions: The study affirms that children involved in volleyball training programs designed to increase sports performance ensure children's sports development, highlighting their efficacy in fostering motor skill acquisition.

ORCID
Enkeleda Muka
https://orcid.org/0000-0001-9651-4505
Hristo Andonov
https://orcid.org/0000-0001-6854-4651

Cite this article as:
Muka, E., Antonova, V., Andonov, H. (2025). Longitudinal effects of a traditional volleyball training on motor skills development in early adolescents. *Proceeding book of the 4th International Scientific Congress "Applied Sports Sciences", 2025, Sofia.* pp. 9 - 14.
https://doi.org/10.37393/ICASS2025/1

Keywords: *volleyball, children, training methodology, motor skills, performance.*

INTRODUCTION

The training methodology is the key factor that influences the overall development of athletes. Coaches are looking to adapt it according to age, gender, and level, in order to optimize its feedback for the athletes' achievements. Volleyball, as a dynamic sport, requires athletes to undergo controlled and systematic preparation, not only in terms of technical performance but also in terms of physical performance. Traditional volleyball training typically involves repetitive exercises and drills in game-like situations, which, although not directly focused on, positively impact children's motor skills. Early studies have consistently emphasized that early adolescence is a critical period for the development of basic motor functions, motor skills, and fundamentals of volleyball techniques. This age is considered a critical period in terms of movement efficiency and neurological maturation. Volleyball is an intermittent activity that necessitates players to engage in frequent short intervals of high-intensity exercise, followed by periods of low-intensity exercise. Significant demands are placed on the neuromuscular system during various sprints, jumps (including blocking and spiking), and high-intensity movements that occur repeatedly during competition. Volleyball players necessitate well-developed speed, agility, upper-body and lower-body muscular power, as well as maximal aerobic capacity (Gabbett, 2008).

The physical and technical qualities of volleyball players change during the season and in response to training. The characteristic of traditional training is that, through exercises with technical requirements, movement actions are integrated that enable the development of fundamental motor skills for volleyball, such as agility, speed, strength, and jumping.

Considering that fundamental volleyball components include a series of motor actions necessary for proper and efficient performance, it is reasonable and entirely justified to anticipate that training exercises aimed at enhancing these elements will also improve motor skills (Nešić et al., 2013). Contemporary volleyball requires athletes to possess advanced general motor skills, as well as specialized skills specific to the sport and specific player positions.

A study by Oliinyk et al. (2021) assessed the impact of physical development characteristics on the motor coordination levels of female volleyball players. The results underscore the need for targeted and individualized methods to enhance motor skills, taking into account the crucial phases of motor development.

Volleyball, as a skill-dependent activity, requires advanced perceptual-motor ability. Therefore, it is suggested that perceptual-motor skills substantially enhance the performance of young athletes in sports that require complex motor tasks (Pion et al., 2015). The importance of implementing skill-based exercises and small-sided games, as well as their influence on the development of motor skills in children, is emphasized in the study by Stojanović et al. (2019), which illustrates the capacity of a specialized training program to improve the physical performance of children. Furthermore, Hadzic et al. (2014) confirm, in their study, the impact and effectiveness of integrating a resistance training program aimed at increasing muscular strength, and also emphasize the importance of personalized training to meet the specific motor skills requirements of athletes.

During the later stages of childhood, children exhibit significant progress in their cognitive abilities and demonstrate an enhanced capacity to execute movement skills at more advanced levels. (Gallahue & Donnelly, 2007).

The primary motor qualities, namely *endurance, strength, speed, joint mobility, and coordination skills,* are essential foundations for acquiring and executing physical-sport motor activities.

Engaging in volleyball has been found to have a beneficial impact on the body's muscle endurance, functional strength, speed, coordination, elasticity, and balance in young individuals. The inclusion of swings, throws, and kicks in volleyball serves as a significant factor in enhancing the overall dynamic muscle strength of both the lower and upper limbs (Sozen, 2012).

This study presents a focused analysis of physical performance indicators utilizing data originally collected for Muka's Ph.D dissertation (Muka, 2025). The purpose of this study is to identify the effectiveness of a traditional volleyball training program in developing the motor skills of volleyball players aged 11-13 years.

METHODOLOGY

Participants

This study was conducted on a group of twenty volleyball girls aged 11-13, athletes of the Partizani sports club. The volleyball athletes have undergone a one-year training program focusing on traditional volleyball training methodology. A traditional volleyball training program aims to develop specific volleyball skills through targeted exercises, emphasizing repetition and game-like situations as key components. The training is scheduled at a frequency of three 90-minute training sessions per week, accompanied by one optional friendly match, with a focus on serving, passing, setting, hitting, blocking, and basic defensive movements. Due to the lack of a U-14 championship organization in Albania, the training program was not strictly designed around the competitive cycle. The primary focus is on the development and progressive improvement of technical and motor skills through game-like situations, transitioned into small-sided games. The training load evolves over the year, progressing through three stages: *skill acquisition and mastery; transitioning from simple drills to more complex ones; skill refinement.*

After receiving confirmation from their parents and explaining the testing procedure in detail, and studying the health situation of all athletes, the measurements were performed in the same environment where the Partizani team trains every day. To obtain accurate data regarding motor indicators, each athlete is entitled to two trials, with a 2-minute break and a 5-minute break between tests. A warm-up consisting of moderate-intensity exercises lasted approximately 15 minutes before the testing procedure began. The athletes were tested twice, at the beginning and end of the training year.

Measuring instruments

Eight motor tests were conducted to assess the athletes' motor skills, carefully selected to account for the specific and dynamic movements inherent in the sport of volleyball.

Tests

The motor test battery includes: T-tests for agility (with tennis ball displacement), Speed Endurance(SE), Standing Long Jump(SLJ), Standing Vertical Jump with both arms (blockade, BJ), Running Vertical Jump(RVJ), Medicine Ball Throwing (2kg)

(MBTH), Catching and Throwing tennis ball (30 sec)(C&TH) and Sit and Reach test (FLEX).

Procedure

The data collected from the physical performance indicators of volleyball players aged 11-13, before and after the one-year training period, were analyzed using SPSS software. A paired samples t-test was performed to determine whether the team's physical performance indicators changed after training. This test examined the effects of training over time. It allowed for assessing whether significant differences existed between the means of paired observations.

RESULTS

Table 1 shows the descriptive statistics of the changes in Min, Max, Mean, Std. Dev. and CV (%) values for the reflected motor skills indicators as a result of the application of an annual volleyball training program based on the traditional methodology. Overall, it appears that there is *an increase for most indicators, indicating improvements in motor skills within a one-year training* period.

The Mean values for all measured motor skill indicators show an increase in values (except for T-test and SE) from the period before to the one after the one-year training phase, indicating that the training program has had a positive impact on the development and improvement of motor skills in this age group of volleyball players. The T-test Mean (19.81; 18.82) and Speed Endurance Mean (24.62; 22.41) values decreased after training. However, since the improvements in the results of these indicators are expressed as reduced values, we conclude that these two indicators have also improved.

Table 1. *Descriptive statistics of physical performance indicators*

	Partizani (*N*=20)				
Test	**Min**	**Max**	***Mean***	***SD***	**CV (%)**
T-test for agility before the experimental period.	15.76	22.84	19.81	2.20	11.1
T-test for agility after the experimental period	15.63	22.34	18.82	2.06	10.9
Speed endurance before the experimental period	18.67	36.32	24.62	4.33	17.5
Speed endurance after the experimental period	17.76	29.61	22.41	3.04	13.6
Standing long jump before the experimental period	100.00	174.00	128.80	19.97	15.5
Standing long jump after the experimental period	120.00	170.00	140.00	16.94	12.1
Standing vertical jump with both arms (blockade) before the experimental period	15.00	29.00	22.60	4.15	18.4
Standing vertical jump with both arms (blockade) after the experimental period	16.00	33.00	24.90	4.81	19.3
Running vertical jump before the experimental period	15.00	35.00	24.60	5.47	22.2
Running vertical jump after the experimental period	20.00	41.00	31.75	5.99	18.9
Medicine ball throwing before the experimental period.	175.00	340.00	271.15	44.69	16.5
Medicine ball throwing after the experimental period.	220.00	400.00	321.50	51.02	15.9
Catching and throwing a tennis ball before experimental period	15.00	24.00	19.10	2.57	13.4
Catching and throwing a tennis ball after the experimental period	18.00	27.00	22.20	2.33	10.5
Flexibility before the experimental period	8.00	20.00	10.95	6.30	57.5
Flexibility after the experimental period	0.00	23.00	14.50	5.84	40.3

Note: From "Methodology of developing technical skills in 11-13-year-old volleyball players in Albania" by Enkeleda Muka, 2025, Ph.D. dissertation, National Sports Academy "Vassil Levski", Sofia, Bulgaria.

The results of Table 2, derived from Muka's (2025) Ph.D. dissertation, indicate *significant changes* in the variables over time for all specified pairs (*Mean difference of test1-test2*), with varying degrees of significance and direction of change. For the *T-test* (T-TEST1 – T-TEST2) and *Speed Endurance* (SE1-SE2), there is a significant decrease *(p < .05)* in values. However, since the improvements in the results of these indicators are expressed as reduced values (higher results), we conclude that these two indicators have noticeable improvements due to the volleyball training program.

At the same time, *for all the other indicators,* SLJ *(*-11.20; p < .001), BJ *(*-2.30; p = .024), RVJ *(*-7.15; p < .001), MBTH*(*-50.35; < .001), C&TH*(*-3.10; < .001), Flex*(*-3.55; < .001*), we observe a significant increase after the one-year training period (p < .05), providing higher results, thus significant improvements for all tested indicators of motor skills performance.*

Table 2. *Results of the Paired Samples T-test used to compare physical performance indicators before and after the experimental period.*

Pair	Paired Samples Test				
	***Mean* difference**	**Std. Error Mean**	***t***	**df**	***p*-value**
T-TEST1 – T-TEST2	0.99	0.30	3.31	19	.004
SE1 - SE2	2.21	0.51	4.35	19	<.001
SLJ1 - SLJ2	-11.20	1.73	-6.47	19	<.001
BJ1 - BJ2	-2.30	4.18	-2.46	19	.024
RVJ1 - RVJ2	-7.15	4.28	-7.46	19	<.001
MBTH1 - MBTH2	-50.35	6.39	-7.88	19	<.001
C&TH1 – C&TH2	-3.10	0.38	-8.24	19	<.001
FLEX1 - FLEX2	-3.55	0.83	-4.30	19	<.001

Note: [SE]Speed endurance,[SLJ]Standing Long Jump,[BJ]Block Jump,[RVJ]Running Vertical Jump,[MBTH]Medicine Ball Throwing, [C&TH] Catch and throw tennis ball,[FLEX]Fleksibility
From "Methodology of developing technical skills in 11-13-year-old volleyball players in Albania" by Enkeleda Muka, 2025, Ph.D. dissertation, National Sports Academy "Vassil Levski", Sofia, Bulgaria.

DISCUSSION

The results obtained from the tests show significant positive changes for the indicators examined in this study ($p < .05$). The significant values obtained for all indicators ($p < .05$) clearly demonstrate the effectiveness of the volleyball training program in children aged 11-13 years, with a notable impact on the growth and development of physical performance in this age group. Although the primary focus of the training program is not on developing motor skills, this suggests that the typology of exercises and the dynamics of volleyball training in children have a significant impact not only on technical performance but also on physical performance. The significant increase in motor skill indicators shows that the applied training program was comprehensive and successful in training the different components of motor development. Additionally, these results, obtained after one year, also demonstrate a positive effect when training is consistent and prolonged, providing an opportunity for muscular adaptation and the mastery of fundamental movement patterns.

Pereire et al. (2015) state that both the act of throwing a ball and the ability to jump are significant determinants of successful volleyball performance. For a successful volleyball performance, jumping performance and ball throwing are both considered important factors (Marques et al., 2009). The measurement of *ball-throwing distance* holds significance within the realm of athletic performance. On the other hand, the ball-throwing distance is also an important part of this sport. Regarding this, previous studies have demonstrated and concluded that, based on explosive movements, upper extremity performance can be improved with the help of strength training during the competitive season (Marques et al., 2009; Gabbett & Georgieff, 2006). Since these adaptations require a specific training period, the literature suggests that, in terms of ball speed, this may facilitate transfer to specific tasks in volleyball.

Align with our study, the findings of Muka (2025) which were based on the implementation of a scientific training methodology with a primary focus on the development of technical skills, showed significant improvements in motor skills, agreeing that in both cases the typology of volleyball training in this age group undoubtedly affects motor skills provided that they are engaged in structured and organized sports led by a professional coach.

The study conducted by Muka (2024) demonstrates that the established methodology delivers a specific training stimulus that simulates the technical requirements of volleyball players. The components of intentional instructional training designed for skill acquisition and mastery of volleyball's technical elements, including specific skill exercises, repetition, feedback, and correction, appear to be crucial and effective, thereby ensuring that organized and concentrated training enhances the precision, automaticity, and efficacy of the technique.

To the attention of coaches, we suggest prioritizing training sessions that incorporate game-like situations, allowing athletes to develop their coordination and decision-making skills more effectively. This approach not only enhances overall performance but also reduces the risk of injury and has a positive impact on psychological development, preparing athletes for real matches.

A primary limitation of this study is the lack of a control group. Although this longitudinal study provides improvement data of motor skills indicators over the training period, these are not entirely attributable to the training process. Natural maturation factors may also have contributed. Future research could incorporate a control group to isolate and evaluate the effects of the training process. However, pre- and post-data provide a strong foundation for understanding the impact of the volleyball training program on children's motor development.

CONCLUSIONS

The significant increase in the tested physical performance indicators of 11-13-year-old volleyball players indicates a comprehensive impact of volleyball training on the motor development of children. Skills such as agility, speed, jumping, strength, and flexibility are integrated into the volleyball training program through training in game-like situations. Such skills demonstrate the diversity of training practices incorporated into volleyball, intending to optimize the athlete's overall performance. Children in this age group not only become skilled at dealing with the circumstances of a volleyball game, but the development of these motor skills through volleyball also enables them to engage easily in other sports activities.

The combination of technical training and motor skills development is crucial, especially during the ages of 11 to 13. Motor skills are essential indicators for assessing the ability of an aspiring volleyball player. The correlation between motor skills and training quality for young volleyball players is advantageous (Muka, 2023). For young athletes to achieve great results, they need to possess a well-developed physique and demonstrate appropriate agility (Zlatev, 2022).

Even in the research conducted by Nešić et al. (2013), which aimed to gain insights into the effectiveness of volleyball training in children aged 13-14 years, noticeable improvements were observed in overall and motor skills during the 3-month training period.

The results of our study assess the impact of traditional training methodology on the overall technical and physical development of children aged 11-13 years. A specific sports training methodology can significantly influence the motor development of key components essential for a successful future athlete. These achievements should not be understood only as volleyball-related skills. They are long-term skills that influence the individual's ability to participate in various physical activities throughout life.

This study provides clear evidence regarding the effectiveness of volleyball training in overall motor development. It establishes a foundation for future research willing to incorporate a control group or to compare different training methodologies, aiming at determining whether the training program is effective or requires optimization for improvement. Based on our findings, this approach is beneficial and appropriate for the motor development of this age group.

This study offers valuable insights for sports specialists to emphasize the importance of this approach for the overall development of young athletes. The study confirms that children participating in volleyball training programs designed to enhance sports performance and promote sports development effectively foster motor skill acquisition. The broader implications of these findings extend beyond volleyball and strongly influence training methodologies in other sports and developmental contexts.

REFERENCES

Gabbett, T. J. (2008). Do Skill-Based Conditioning Games Offer a Specific Training Stimulus for Junior Elite Volleyball Players? *Journal of Strength and Conditioning Research*, *22*(2), 509–517. https://doi.org/10.1519/JSC.0b013e3181634550

Gabbett, T. J., & Georgieff, B. (2006). The Development of a Standardized Skill Assessment for Junior Volleyball Players. *International Journal of Sports Physiology and Performance*, *1*(2), 95–107. https://doi.org/10.1123/ijspp.1.2.95

Hadzic, V., Sattler, T., Veselko, M., Markovic, G., & Dervisevic, E. (2014). Strength Asymmetry of the Shoulders in Elite Volleyball Players. *Journal of Athletic Training*, *49*(3), 338–344. https://doi.org/10.4085/1062-6050-49.2.05

Marques, M. C., Tillaar, R. V. D., Gabbett, T. J., Reis, V. M., & González-Badillo, J. J. (2009). Physical Fitness Qualities of Professional Volleyball Players: Determination of Positional Differences. *Journal of Strength and Conditioning Research*, *23*(4), 1106–1111. https://doi.org/10.1519/JSC.0b013e31819b78c4

Muka, E. (2024). The impact of developed training methodology on the technical skills of volleyball players aged 11-13 years. Longitudinal study. *Series on Biomechanics*, *38*(1). https://doi.org/10.7546/SB.02.01.2024

Muka, E. (2023). Correlations between motor skills and technical skills at female volleyball players aged 11-13 years old of Albania. *Annual of*

National Sports Academy 'Vassil Levski', *1*, 263–269.

Muka, E. (2025). *Methodology of developing technical skills in 11-13-year-old volleyball players in Albania* [Ph.D dissertation]. National Sports Academy 'Vassil Levski', Sofia, Bulgaria.

Nešić, G., Ilić, D., Majstorović, N., Grbić, V., & Osmankač, N. (2013). Training effects on general and specific motor skills on female volleyball players 13-14 years old. *Sportlogia*, *9*(2), 119–127.

Oliinyk, I., Doroshenko, E., Melnyk, M., Sushko, R., Tyshchenko, V., & Shamardin, V. (2021). Modern Approaches to Analysis of Technical and Tactical Actions of Skilled Volleyball Players. *Physical Education Theory and Methodology*, *21*(3), 235–243. https://doi.org/10.17309/tmfv.2021.3.07

Pion, J. A., Fransen, J., Deprez, D. N., Segers, V. I., Vaeyens, R., Philippaerts, R. M., & Lenoir, M. (2015). Stature and Jumping Height Are Required in Female Volleyball, but Motor Coordination Is a Key Factor for Future Elite Success. *Journal of Strength and Conditioning Research*, *29*(6), 1480–1485. https://doi.org/10.1519/JSC.0000000000000778

Sozen, H. (2012). The Effect of Volleyball Training on the Physical Fitness of High School Students. *Procedia - Social and Behavioral Sciences*, *46*, 1455–1460. https://doi.org/10.1016/j.sbspro.2012.05.320

Zlatev, B. (2022). A Study of Some Anthropometric Indicators and Their Interaction with Agility in 14-Year-Old Football Players. *Series on Biomechanics*, *36*(2). https://doi.org/10.7546/SB.36.2022.02.09

Corresponding author:
Enkeleda Muka, PhD
Sports University of Tirana
Tirana, Albania
E-mail: mukaledi4@gmail.com

IV International Scientific Congress "Applied Sports Sciences"

PROCEEDING BOOK

Peer-Review Statement

All full-text papers included in this conference proceedings volume have undergone a rigorous peer-review process. Each submission was evaluated by at least two independent reviewers with academic expertise relevant to the topic of the paper. Reviews were conducted in accordance with established scholarly standards, ensuring the quality, validity, and originality of the published contributions. Only papers that met the required scientific and ethical criteria were accepted for publication.

Publication Ethics and Malpractice Statement

The editors of this conference proceedings volume are committed to upholding the highest standards of publication ethics, following the principles outlined by the Committee on Publication Ethics (COPE).

By submitting their manuscripts, all authors confirm that:

- their work is original and has not been previously published or submitted elsewhere;
- the research presented is conducted in accordance with accepted ethical standards;
- all sources used are properly cited;
- there is no plagiarism, data fabrication, or falsification;
- all authors have contributed substantially to the manuscript and approve its final version;
- any conflicts of interest have been disclosed.

The editors maintain responsibility for the integrity of the publication process, ensuring fair and unbiased review, confidentiality of submissions, and immediate action in cases of suspected misconduct. Any breaches of ethical standards will lead to correction, retraction, or other appropriate measures.

21–22 November 2025

Sofia, Bulgaria

IV International Scientific Congress "Applied Sports Sciences"

21–22 November 2025
Sofia, Bulgaria

PROCEEDING BOOK

EDITORS OF THE PROCEEDING BOOK:

Prof. Ognyan Miladinov, DSc
Assoc. Prof. Milena Kuleva, PhD
Assoc. Prof. Stefka Djobova, PhD

Design: Slavka Asenova, Svetla Kostova
Publisher: Scientific Publishing House NSA Press
ISBN (Online): 978-954-718-803-7