SPORT TK-EuroAmerican Journal of Sport Sciences

https://revistas.um.es/sportk Online ISSN: 2340-8812

Received: **08/05/2025.** Accepted: **07/09/2025.** Published: **25/12/2025**

Effects of a training method on 13-14-year-old female volleyball players in Tirana, Albania

Blerina Mema[1*], Enkeleida Lleshi[2], Altin Martiri[3]

[1] Department of Education and Health, Faculty of Movement Sciences, Sports University of Tirana, Albania.

[2] Department of Sports Performance, Sports Research Institute, Sports University of Tirana, Albania.

[3] Department of Sports Collective, Faculty of Movement Sciences, Sports University of Tirana, Albania.

* Correspondence: Blerina Mema; memablerina@gmail.com

ABSTRACT

The aim of this study was to improve skill indicators in female volleyball players of Tirana in Albania, with a real-time training model of 15 min. A total of 30 female volleyball players, aged 13-14 years (13.0±0.6 years), was divided into two teams: the experimental team (N = 15) and the control team (N = 15). The study was conducted from September to December 2023. During this period of time, the experimental team underwent a 15-minute training intervention, 3 times a week, while the control team followed the coach's standard training program. Participants were subjected to anthropometric measurements, including body height, body weight, and Body Mass Index (BMI). Subjects were also tested on Squat Jump (SJ), Counter Movement Jump (CMJ), 20-cm Drop Jump (DJ), Agility Test, Lateral Change of Direction, T-Test, Shuttle Run Test (10 x 5 m) and Hexagonal Test. The tests were conducted before and after the implementation of the intervention training program. The linear effect of the intervention was statistically significant [$F(1,22) = 53.797$, $p<0.001$)], indicating that there is a significant difference across levels of intervention. The findings from this study suggest that the applied methodology is effective in comparing performances, enabling trainers to design real-time training programs for developing specific physical components based on existing conditions.

KEYWORDS

Volleyball; Circuit; Training; Agility; Test

1. INTRODUCTION

The sport of volleyball is quite popular among males and females of different age groups in Albania. According to official statistics, there are 1,700 active players, of whom 292 licensed men and 858 licensed women (Confederation of European Volleyball, n.d.). Volleyball is a complex team game that requires multi-faceted sports skills and is characterized by components, such as general strength, endurance, speed, agility and coordination. For children aged 11 - 14 years, it is recommended that the training intensity be increased to improve athletic performance. According to Bompa et al. (2015), at this stage of their development, some athletes are likely to show a growth spurt (a 14-year-old playing sport can display large changes in physical potential similar to that of a 16-year-old), and as a result manifest a lack of coordination during training. Therefore, the emphasis must fall on improving the qualities and skills of athletes and not on physical performance or winning during competitions or matches.

Sakalidis et al. (2021) show that the constant training process of physical fitness of volleyball team members allows to correct training process and appoint new exercises that develop and reinforce specific aspects of young athletes' training. Agility, as a main component is viewed as an important quality required by team sports athletes (Lloyd et al., 2014; Serpell et al., 2011). Although there may be variations in the proposed definitions of agility, there seems to be a broad consensus in defining agility as a rapid whole-body movement with change of velocity or direction in response to a stimulus (Sheppard & Young, 2006). The methods and effects of agility training are thought to vary with biological age. Recommendations regarding age-appropriate agility training are largely speculative due to the lack of literature in this area according to (Jeffreys et al., 2019). Researchers have concluded that recruitment of prospective athletes into the volleyball team is mainly composed of testing their jumping abilities, as well as agility due to them being the most basic components during an evaluation of the sports capabilities of a candidate (Lath et al., 2021).

Mema & Lleshi (2023) have identified that combined training programs can be considered a safe and successful method when working with adolescents and it is shown that the relationship between agility performance and physical qualities depends on the age of the athletes, where in the age group of U11-U14 moderate relationships between speed performance and agility have been observed.

Referring to the sports games and the age of the athletes according to (Bompa & Carrera et al., 2015), in the sport of volleyball, the pre-puberty phase coincides with the age of 10-12 years, the postpuberty phase coincides with the age of 15-16 years and the maturity phase coincides with the age of 22-26 years.

Encouraging coaches and those in charge of the training process to use and develop harmonic abilities exercises is crucial, as they are an important, effective, and influential part of improving and developing the skill performance of volleyball players according to (Asfour et al., 2022). If the coaches had implemented a training program with the aim of improving the volleyball players' parameters, they would have improved the indicators of strength such as elastic strength, neuromuscular explosiveness performance, and speed of change-of-direction ability show (Margaritopoulos et al., 2015; Christos et al., 2020; Paes et al., 2022).

Current practical data on the effectiveness of training programs in team sports in age groups can be said to be still limited as a gap in scientific articles is evident. However, based on the existing body of literature, specific training programs can improve agility among volleyball players. According to Thatisa (2024), 8 weeks of circuit training program helps develop improved agility in male volleyball players. These findings are in line with the findings of Chuang et al. (2022) who have concluded that appropriate agility training can enhance agility in lateral movements and sprinting speed, as well as enable players to rapidly complete defensive movements. According to a pilot study conducted in Tirana Albania (Mema & Lleshi, 2023), improvement of agility indicators among young volleyball players can be achieved through a specific training model. According to Mema & Lleshi (2023) the training process of young volleyball players in Association Sports Tirana in Albania is conditioned by the availability of developing training sessions with a specific training purpose. It is therefore vital that coaches in Albania find new effective methods to develop agility, speed and coordination of volleyball players in different age groups and to implement those methods in the training process in order to improve effectiveness and enhance the team’s overall performance. For this reason, we undertook to conduct an experiment with 13-14-year-old female volleyball players, building a training program grounded in scientific principles and to benefit coaches in Albania.

This study analyzes the importance and the effects of implementing a 15-minuteintervention program in improving physical abilities of 13-14-year-old volleyball players.

2. METHODS

2.1. Participants

Out of the 4 Sports Associations in Tirana, Albania, only 2 Sports Associations were randomly selected for our study and will be divided into the Experimental team (EX=15) and the Control team (CO=15). The subjects were 30 girls who have been playing volleyball for at least 2 years and who train 3 times a week for 90 minutes. The procedure of implementing the study was explained to all the volleyball players and they expressed their agreement. This study was approved by the Ethics Council of the Sports University of Tirana, Albania and all participants and their parents/coaches (in case they were below 18 years old) signed the written informed consent, which meets the ethical standards of the Declaration of Helsinki. The study started in September to December 2023. Both volleyball teams included in the study were subjected to anthropometric measurements: body height, body weight and BMI kg/m^2.

2.2. Procedure

The volleyball players were tested in some physical performance parameters, Before and After the implementation of the training program with the experimental team for 11 weeks, while the Control group developed the training according to the method of their coach. The tests were conducted in the "Laboratory of Biomechanics" and in the "Fitness Gym" at the Sports University of Tirana. The subjects performed a warm-up of 10 min before the beginning of the tests.

2.3. Instruments

In order to collect data for the purpose of our study, we used the protocol tests, that were to evaluate the purpose of our study are; Squat Jump (SJ), Countermovement Jump (CMJ), Drop Jump 20 cm (DJ20). Agility Test; Lateral Change of Direction (LCD), T -Test (T-T), Shuttle Run Test 10 x 5 m (SHRT) and Hexagonal Test (H-T). Leonardo Mechanography® GRFP standard variant of STD is an instrument that measures the weight, strength, power, speed of response from the platform, and the height of the jump in (cm) considering the center of gravity displacement for the lower limb movements in the subjects included in the study. Agility tests were assessed in the gym with a stopwatch.

2.4. Intervention

The training program was implemented in the Experiment group and will extend over 11 weeks, with 3 sessions per week lasting about 15 minutes. This intervention took place before ball practice. The experimental group was tested before and after the implementation of the training program. Also, the control group will be tested before and after the 11-week training that they will develop according to the method of their trainers. The training program begins with a general warm-up of 10 minutes and then the implementation begins.

The training program is built in the form of a circuit, based on the "step load" which increases progressively in the first 2 weeks, while in the third week the load decreases slightly to enable the recovery of athletes, a suitable method for U12 – U15 (see table 1) (Bompa & Carrera, 2015; Bompa & Sarandan, 2022). The circuit will contain 7 stations/exercises through which will improve agility, speed and coordination in the age group under study:

1) Squat with arms extended in front

2) Skip in Hexagon with one foot inside the other outside in 4 directions (front-back, left-right or back-side-left-right and front-side-left-right).

3) 20cm hurdle jump and 1-foot lateral shift to the left, hurdle jump and 1-foot shift to the right.

4) Side skips left and right on the stairs.

5) Change of direction run (COD). The first two distances will be covered with lateral running and the following 4 distances, straight running with a change of direction.

6) Horizontal left-right step plyometric.

7) Exit the circuit by running straight ahead 4-5m.

The distance from one station to the other will be 2-3 m and the ratio of working time to rest time will be 1:2 (Weineck, 2009). Special importance has been given to the phase of getting to know and learning the technique of executing the exercises, planning that this phase should extend over the first 2 weeks (Sopa, 2019). In this phase, the load is standard in all sessions, 2 repetitions per session. The next 9 weeks are divided into 3 mezzo cycles where each of them is divided into 3 micro cycles.

Table 1. Planning the training load in week

<table>
<tr><th>Sessions
Day</th><th>Period
Weeks</th><th>1
Monday</th><th>2
Wednesday</th><th>3
Friday</th></tr>
<tr><td>1 + 2</td><td colspan="4">Familiarity with circuit exercises and learning the technique of their execution. The load for the first 2 weeks will be fixed, 2 repetitions in each training session, 5 Squats.</td></tr>
<tr><td rowspan="2">3</td><td>3</td><td colspan="3">The circuit will be repeated 2 times. 8 Squats
The ratio between work and recovery time will be 1:2</td></tr>
<tr><td>4</td><td colspan="3">The circuit will repeat 3 times. 8 Squats</td></tr>
</table>

		The ratio between work and recovery time will be 1:2
	5	The circuit will be repeated 2 times. 8 Squats The ratio between work and recovery time will be 1:2
3	**6**	The circuit will be repeated 2 times. 8 Squats The ratio between work and recovery time will be 1:2
	7	The circuit will repeat 3 times. 8 Squats The ratio between work and recovery time will be 1:2
	8	The circuit will be repeated 2 times. 8 Squats The ratio between work and recovery time will be 1:2
3	**9**	The circuit will be repeated 2 times. 8 Squats The ratio between work and recovery time will be 1:2
	10	The circuit will repeat 3 times. 8 Squats The ratio between work and recovery time will be 1:2
	11	The circuit will be repeated 2 times. 8 Squats The ratio between work and recovery time will be 1:2

2.5. Statistical Analysis

Statistical analysis and data processing were performed using IBM SPSS Statistics 26 Software. The statistical technique that was used is: descriptive analysis; which involves the use of descriptive statistics to explain the data clearly. Inferential analysis that includes analysis of variation (ANOVA, t-test) for comparing the average of more than two groups, and correlation analysis to assess the relationships between two or more variables. This data analysis and processing helped us in understanding and evaluating the data in order to reach reliable conclusions.

3. RESULTS

Our study started with an initial anthropometric measurement, in September 2023, we measured, as can be seen in Table 2, the following anthropometry parameters: Body Height, Body Weight and BMI. The experimental team has an average of; (age: 13.4±0.6 years, Height: 167.1±3.82 cm, Weight: 54.74±4.35 kg, BMI: 19.54±3.32 % and CO team has an average of; (age: 13.9±0.1 years, height: 162.3±2.36 cm, Weight: 53.4±3.6 kg, BMI: 20.92±4.3%. Table 2 shows the values of agility test and jump height capacities of the two team's volleyball players taken in our study. Variables of tests that are taken in our study are: 1. Distances measured in meters/second: LCD, T-Test, Hexagon and SHRT-10x5m. 2. Units of measured from lab tests: Height of Jumping from test SJ and CMJ without the help of arms. 3. Contact Time in drop jump from 20cm cube.

Table 2. Descriptive table of the average pre- and post-test results of volleyball players

Anthropometric Measurements	**Experimental**		**Control**	
Age (years old)	13.4 ± *0.6*		13.9 ± *0.1*	
Body Height cm	167.1 ± *3.82*		162.3 ± *2.36*	
Body Weight kg	54.74 ± *4.35*		53.4 ± *3.6*	
BMI kg/m^2 %	19.54 ± *3.32*		20.92 ± *4.3*	
Agility Test	**Experimental**		**Control**	
	Pre-	**Post-**	**Pre-**	**Post-**
LCD	7.4	6.9	8.27	7.77
T-Test	14.61	13.07	14.51	13.59
SHRT-10x5m	21.33	17.76	20.68	19.25
Hexagon	17.18	13.37	16.02	14.34
Jump Height (JH)	**Experimental**		**Control**	
	Pre-JH	**Post-JH**	**Pre-JH**	**Post-JH**
SJ	0.3	0.33	0.27	0.28
CMJ	0.31	0.34	0.26	0.27
DJ 20 cm/ sec.	1.31	1.35	1.16	1.21

Note. *SJ: Squat Jump. CM; Countermovement Jump. DJ20; Drop Jump 20 cm. JH; Jump Height. Agility Test; Lateral Change of Direction (LCD), T -Test (T-T), Shuttle Run Test 10 x 5 m (SHRT) and Hexagonal Test (H-T)*

The results of the comparison of the parameters of agility and jump are taken in the pre- and post- implementation of the experiment of the training program that we used. After the period of 11 weeks of following the training program for developing agility skills from the experimental team we repeated measurements in the final evaluation (as we can see in Table 2) following the same procedure as at the initial testing. The parameters chosen for the measurement were important in our volleyball training method and also in the evaluation of agility parameters. The training used in group Experimental has shown an impact in improving the agility after the training program.

4. DISCUSSION

The results of the anthropometric parameters indicate that the differentiation between team EX and CO is small in value and there was no significant result, this is related to the morphological characteristics. Ho et al. (2019) pointed out that the workload of a skill-based training program should be appropriate to improve the players' adaptability and achieve enhanced sports performance. Paska et al. (2023) based on their research findings on volleyball female players, have reached to the conclusion that agility is an essential part of team sports. They confirmed that movement speed ability was one of the determinants involved in the level of planned agility statistically significant relationships at the 5% level.

Repeated-measures analysis of variance (ANOVA) is a suitable method for evaluating the effectiveness of an intervention on a time-dependent (post-intervention) variable with 2 groups, as it provides control for individual differences and the ability to examine changes in time within and between groups. In this case, the goal is to evaluate the effectiveness of the intervention in four dependent variables, evaluated according to two groups: the experimental group and the control group. The linear effect of the intervention is statistically significant [(F (1, 22) = 53.797, p<0.001)], indicating that there is a significant difference across levels of intervention. The results of ANOVA with repeated measurements highlight the effectiveness of the intervention on the impact of the dependent variables, resulting in statistically significant differences in the impact of the intervention for both experimental and control groups. A p-value of 0.292, greater than the pre-determined significance level (0.05), speaks for statistically significant changes.

The results were compared between the initial and final tests and were as follows: In the Lateral Change of Direction (LCD) test, we can observe a time reduction of 0.5 sec. between the initial test (7.4 sec) and the final test (6.9 sec) in the experimental group 6.7%. But still volleyball players remain in poor values from the normative reference date. Negligible change was also observed in the control group. Regarding the T-Test, we can see a time reduction of 1.54 sec. between the initial test (14.61 sec) and the final test (13.07 sec) in 4.5%, while the control group had a lower value of 0.92 sec. But compared to the values of the Stamm et al. (2022) study, volleyball girls are faster in the T-Test (11.96 sec). The 10 x 5m shuttle test was intended to measure the speed and coordination skills of the volleyball players. According to the results of the test, it was found that the speed and coordination values of the female volleyball at the start of the study were close. But the experimental group had an improvement of 3.57 sec. between the initial test (21.33 sec) and the final test (17.76 sec) in 6.9 %, while the control group had a lower value of 1.43 sec. Padrón-Cabo et al. (2020) reported that the 6-week agility ladder training provides 2.54% enhancement on 10 m sprinting. The hexagon test is a reliable measure of agility, with a high test-retest reliability rate (ICC = 0.93, p < 0.001). After the results in the Hexagon test, we can see a time reduction of 3.81 sec. between the initial test (17.18 sec) and the final test (13.37 sec) in 10.4 %, while the control group had a lower value of 1.68 sec.

Plyometric training is frequently reported to improve vertical jump performance and leg power (Markovic, 2007). Plyometric exercises are very effective at increasing strength and improving physical performance (Piirainen et al., 2014). This technique is commonly utilized for volleyball conditioning (Lehnert, 2009). According to Yessis & Hatfield (1986), plyometric training is crucial in developing maximal explosive power and speed of movement, and can result in the increase of two critical elements of strength, starting strength and explosive strength.

However, few studies have considered the possibility that plyometric training can boost agility and sprinting performance of volleyball players (Lehnert et al., 2009; Hrženjak et al., 2016). Theoretically, plyometric training may help volleyball players develop both capacities. Two studies tested the benefits of plyometric training on the agility of volleyball players in both sexes. In a study conducted over eight weeks in U-15 female volleyball players, it was observed that performance at in a shuttle run (6 m × 6 m) was significantly improved (by 0.7 s) according to Lehnert et al. (2009). In our experiment developed with 13-14-year-old female volleyball players, no big difference was observed between the groups in the vertical jump indicators. The vertical jump test values evaluated from the center of gravity from the "Leonardo" platform shown in Table 2 are; EX team in SJ=0.03 and CO team=0.01 (6.3%), in test CMJ the EX team=0.03 and CO=0.01 (5.8 %) and in the 20-cm DJ test the values are: EX team=0.04 sec and CO=0.05 sec (1.3%). Šiskova et al. (2021) in the 6-week intervention in soccer players on plyometric-agility components, they can't be able to confirm that one of the training programs is more effective, their findings highlight the importance of establishing agility and plyometric training at an early age as they contribute to developing agility and running acceleration of athletes.

Sopa (2019) showed that six-month agility training program had good influence on the development of our volleyball players both on the agility skill components (coordination, speed, balance, laterality, quick change of direction etc., and also on anthropometric parameters and proportionality indices. Similar findings have been reported by Chuang & colleagues (2022). In this point of view, a big role in the process of developing agility is a good training timeline and efficient program of exercises. Fernández Juan et al. (2022) shows that parkour is a valid method to increase students' agility in physical education in secondary education, obtaining better improvements than team sports among males, although it does not seem to be more favorable than team sports among females. Martiri and Lleshi (2024) show that it is necessary for a detailed compilation of test exercises to ensure objectivity and truthfulness of information about the real level of volleyball player readiness and accordance of their jumping ability and agility to the requirements of modern volleyball.

More specifically, coaches, by virtue of their role as managers and experts, and their skill and experience, have the role of adapting the working methods and the intensity of training according to the athletes' responses to the planned effort, without departing from the proposed goals (Hulpus, 2014b). Moreover, Stamm et al. (2022) hold the view that, namely in this age group 13-16, the athletes of sports games should practice agility and be tested in it, as, according to literature, the development of agility slows down at the age of 16–17 years, and therefore, can be one of the obstacles for reaching the top in adult athletes.

5. CONCLUSIONS

The training program of 15 min that was used in this study was adapted to the specific techniques of movements on the field for volleyball players. This study shows us that the methodology used is correct and helps to compare the performances which help the trainers to program training in real time for the development of some physical components based on the conditions they are in. The results of the present study suggest that agility training improves the performance of young female volleyball players in their sport-specific skills. The research results confirm existing wide practical possibilities in perfecting and improving young players', aged form 13 to 14 years, moving in various directions abilities, using our presented tests, adequate to volleyball game activity.

6. REFERENCES

1. Asfour, H. R., Rajah, T. G. A., & Asfour, R. H. M. (2022). The relationship between some harmonic abilities and the level of skill performance among elite volleyball players in Palestine. *SPORT TK-Revista EuroAmericana de Ciencias del Deporte*, *24*, 1-18. https://doi.org/10.6018/sportk.539101
2. Bompa, T. O., & Carrera, M. (2015). *Conditioning young athletes* (1st ed.). Human Kinetics.
3. Bompa, T. O., & Carrera, M. (2015). *Conditioning young athletes* (1st ed., pp. 13–17). Human Kinetics.
4. Bompa, T. O., & Sarandan, S. (2022). *Training and conditioning young athletes*. Human Kinetics.
5. Chuang, C. H., Hung, M. H., Chang, C. Y., Wang, Y. Y., & Lin, K. C. (2022). Effects of agility training on skill-related physical capabilities in young volleyball players. *Applied Sciences, 12(*4), 1-8. https://doi.org/10.3390/app12041904
6. Confederation of European Volleyball. (n.d.). *Albanian Volleyball Federation*. Inside CEV. Retrieved March 28, 2025, from https://inside.cev.eu/institutions/federations/albania
7. Fernandez Juan, D., Garcia-Martinez, S., Sotos-Martinez, V. J., & Ferriz-Valero, A. (2022). Application of parkour in Physical Education: Agility learning and improvement. *Journal of Physical Education and Sport, 22*(3), 709–714. https://doi.org/10.7752/jpes.2022.03089
8. Ho, C., Lin, K., Hung, M., Chang, C., & Chen, K. (2019). System design and application for evaluation of digging agility in college male volleyball players. *Journal of Sports Engineering and Technology*, *233*(3), 424–431. https://doi.org/10.1177/1754337119840837
9. Hrženjak, Trajković, & Krističević. (2016). Effects of plyometric training on selected kinematic parameters in female volleyball players. *Sport Science*, *9*(2), 7–12. http://bib.irb.hr/datoteka/830705.Effects_Hrenjak.pdf
10. Hulpus, I. A. (2014b). *Managementul organizațiilor și activității sportive.* Sibiu*:* Editura Universității "Lucian Blaga".
11. Ioannides, C. P., Apostolidis, A., Hadjicharalambous, M., & Zaras, N. (2020). Effect of a 6- week plyometric training on power, muscle strength, and rate of force development in young competitive karate athletes. *Journal of Physical Education and Sport*, 2020(04), 1740–1746. https://doi.org/10.7752/jpes.2020.04236

12. Jeffreys, I. (2019). Agility training for young athletes. In *Routledge eBooks* (pp. 228–247). https://doi.org/10.4324/9781351115346-11
13. Lath, F., Koopmann, T., Faber, I., Baker, J., & Schorer, J. (2021). Focusing on the coach's eye; towards a working model of coach decision-making in talent selection. *Psychology of Sport and Exercise, 56,* 1-17. https://doi.org/10.1016/j.psychsport.2021.102011
14. Lehnert, Lamrová, & Elfmark. (2009). Changes in speed and strength in female volleyball players during and after a plyometric training program. *Acta Universitatis Palackianae Olomucensis. Gymnica*, *39*(1), 59–66. https://www.gymnica.upol.cz/pdfs/gym/2009/01/06.pdf
15. Lloyd, R. S., Faigenbaum, A. D., Stone, M. H., Oliver, J. L., Jeffreys, I., Moody, J., Brewer, C., Pierce, K. C., McCambridge, T. M., Howard, R., Herrington, L., Hainline, B., Micheli, L. J., Jaques, R., Kraemer, W. J., McBride, M. G., Best, T. M., Chu, D. A., Alvar, B. A., & Myer, G. D. (2013). Position statement on youth resistance training: the 2014 International Consensus. *British Journal of Sports Medicine*, *48*(7), 498–505. https://doi.org/10.1136/bjsports-2013-092952
16. Margaritopoulos, S., Theodorou, A., Methenitis, S. M., Zaras, N., Donti, O., & Tsolakis, C. (2015). The effect of plyometric exercises on repeated strength and power performance in elite karate athletes. *Journal of Physical Education and Sport, 15*(2), 310–318. https://doi.org/10.7752/jpes.2015.02047
17. Markovic, G. (2007). Does plyometric training improve vertical jump height? A metaanalytical review. *British Journal of Sports Medicine, 41*(6), 349-355. https://doi.org/10.1136/bjsm.2007.035113
18. Martiri, A., & Lleshi, E. (2024). Volleyball training and practice: vertical jump and agility tests. *SPORT TK-EuroAmerican Journal of Sport Sciences, 13,* 1-14. https://revistas.um.es/sportk/article/view/548591
19. Mema, B., & Lleshi, E. (2023). Comprehensive approach to physical skill in different age groups in sports games. *Scientific Journal of Sport and Performance, 3*(1), 122–129. https://doi.org/10.55860/klge6883
20. Mema, B., & Lleshi, E. (2023). Evaluation of physical abilities in children 13–14 years old in sports games. In *8th International Paris Congress on Sciences & Humanities: Proceedings Book* (pp. 540–543). Paris, France.
21. Padrón-Cabo, A., Rey, E., Kalén, A., & Costa, P. B. (2020). Effects of Training with an Agility Ladder on Sprint, Agility, and Dribbling Performance in Youth Soccer Players. *Journal of Human Kinetics*, *73*(1), 219–228. https://doi.org/10.2478/hukin-2019-0146
22. Paes, P. P., Correia, G. A. F., Damasceno, V. D. O., Lucena, E. V. R., Alexandre, I. G., Da Silva, L. R., Dos Santos, W. R., & De Freitas Júnior, C. G. (2022). Effect of plyometric training on sprint and change of direction speed in young basketball athletes. *Journal of Physical Education and Sport*, *22*(2), 305–310. https://doi.org/10.7752/jpes.2022.02039
23. Paska, Horicka, Czakova, & Polackova. (2023). Examining the interplay between reactive and planned agility with motor and anthropometric parameters in female volleyball players. *Journal of Physical Education and Sport, 23*(10), 2737–2743. https://doi.org/10.7752/jpes.2023.10313
24. Piirainen, J. M., Cronin, N. J., Avela, J., & Linnamo, V. (2014). Effects of plyometric and pneumatic explosive strength training on neuromuscular function and dynamic balance control in 60-70-year-old males. *Journal of Electromyography and Kinesiology, 24*(2), 246-252. https://doi.org/10.1016/j.jelekin.2014.01.010
25. Sakalidis, K. E., Burns, J., Van Biesen, D., Dreegia, W., & Hettinga, F. J. (2021). The impact of cognitive functions and intellectual impairment on pacing and performance in sports. *Psychology of Sport and Exercise, 52*, 1-43. https://doi.org/10.1016/j.psychsport.2020.101840
26. Serpell, R., Mumba, P., & Chansa-Kabali, T. (2011). Early educational foundations for the development of civic responsibility: An African experience. *New Directions for Child and Adolescent Development*, *2011*(134), 77–93. https://doi.org/10.1002/cd.312

27. Sheppard, J. M., & Young, W. (2006). Agility literature review: Classifications, training and testing. *Journal of Sports Sciences*, *24*(9), 919–932. https://doi.org/10.1080/02640410500457109
28. Šiskova, N., Kaplanova, A., Longova, K., Kohut, R., & Vanderka, M. (2021). Effects of plyometric–agility and agility training on agility and running acceleration of 10-year-old soccer players. *Journal of Physical Education and Sport*, *21*(2), 875–881. https://doi.org/10.7752/jpes.2021.02109
29. Sopa, I. S. (2019). Testing and developing agility skill in volleyball players aged 10–12 years. *The European Proceedings of Social and Behavioural Sciences, 62,* 628–639. https://doi.org/10.15405/epsbs.2019.02.78
30. Stamm, R., Stamm, K., & Stamm, M. (2022). Comparison of agility in 13–16-year-old volleyball and football players and non-athletes. *Papers on Anthropology, 31*(1), 81–96. https://doi.org/10.12697/poa.2022.31.1.06
31. Thathisa, P. (2024). The effect of circuit training program on agility in male varsity volleyball players. *Journal of Sports Science and Health,* 25(3), 65–83.
32. Weineck. (2009). *L'allenamento ottimale* (The Optimal training). Perugia, IT: Calzetti e Mariucci.
33. Yessis, M., & Hatfield, F. (1986). *Plyometric training: Achieving power and explosiveness in sports*. Scholastic Coach.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research received no external funding.