IJPESS
Indonesian Journal of Physical Education and Sport Science
p-ISSN 2775-765X | e-ISSN 2776-0200
Volume 5, No. 2, June 2025 Page. 326-334
http://journal.unucirebon.ac.id/index.php ijpess

The Effectiveness of Jumping Rope Training on the Speed and Reaction of U-15 Female Badminton Players

Fatikaha Isauraya[1*], Suratman[2], Rivan Saghita Pratama[3]

[1,2,3]Departemen of Coaching Education, Faculty of Sport Science, Universitas Negeri Semarang. Semarang. Indonesia

*Corresponding Author: isaurayaf@students.unnes.ac.id

Received: 23 May 2025, Approved: 08 June 2025, Published: 30 June 2025

Abstract

Studi purpose. This study aims to determine the differences in speed and reaction between female teenage athletes and non-athletes 15 year-old.

Materials and methods. This study used a quantitative approach with a comparative design. The research sample consisted of 20 adolescent girls who were divided into two groups, namely the athlete group and the non-athlete group. The athlete group consisted of 10 girls who were athletes of PB. Ngudi Berkah and have done skipping rope training regularly three times a week with a duration of 15-20 minutes, for four weeks before data collection whereas, the non-athlete group amounted to 10 adult Taman Junior High School students who did not take part in sports training and did not do skipping rope exercises. The data collection instruments include a 20-meter sprint test to measure speed and a Whole-Body Reaction test to measure reaction time.

Results. Statistical analysis showed that the athlete's group significantly outperformed the non-athletes' group in terms of speed (p = .000) and reaction time (p = .001). These findings suggest that jump rope training effectively improves key performance components in young badminton athletes

Conclusions. Skipping rope exercises are effective in improving speed and reaction, with speed being the more dominant aspect that distinguishes athletes from non-athletes. This exercise can be incorporated into the physical training program for badminton athletes. The results of this study underscore the importance of incorporating jump rope training into structured training program to support early physical development in youth sports.

Keyboards: Jump Rope, Speed, Reaction Time, Badminton, Young Athletes, U-15 Training.

DOI: https://doi.org/10.52188/ijpess.v5i2.1256

Introduction

In the contemporary era, sports have become essential to the human lifestyle (Sastra et al., 2022). Among various sports, badminton stands out as one of the most accessible and widely enjoyed, transcending age and gender (Dameria et al., 2023). Globally, badminton ranks as the second most popular sport after soccer (Mansur et al., 2020). The sport has witnessed significant

growth in Indonesia through local and national training institutions, with strong community support and a consistent record of national and international achievements (Pambudi et al., 2023; Rifai et al., 2020; Limbong, 2021).

The primary objective in badminton is to strategically strike the shuttlecock into the opponent's court to earn points (Sahabuddin 2023). This task requires players to exhibit rapid movement, transition seamlessly between offensive and defensive roles, and maintain high speed and reaction time (Kadafi, Slamet Raharjo, and Nanang Tri Wahyudi 2024). These physical attributes are especially critical in the U15 age category, where athletes are at a pivotal stage of development regarding agility, strength, and endurance (Prasetyo et al. 2024).

At ages 13–15, players are expected to master fundamental techniques and exhibit mature tactical awareness (Suratman & Fransiska, 2014). Therefore, implementing structured training programs that enhance both physical and technical competencies is crucial (Apriantono et al., 2018). Speed, defined as the ability to move the body swiftly from one location to another (Utomo et al., 2023). In badminton, speed is required as one of the components of the game. The speed referred to here is in the form of footwork to retrieve the shuttlecock returned by the opponent, which is usually in the front area of the court (Sanjaya, Dyah, and Amarseto 2023). Speed development is influenced by a combination of agility, muscular strength, reaction capability, balance, flexibility, and neuromuscular coordination (Putra et al., 2018). Volume and intensity of training are aspects that must be considered in training to improve speed, thereby achieving satisfying final results (Imam, Untung, and Lajau 2023).

Similarly, reaction time, the body's promptness in responding to external stimuli, plays a pivotal role in sports performance (Fakhi, S. A., & Barlian 2019). Reaction time is one of the most important criteria for determining how quickly a person's motor response occurs to a stimulus (Hasanah et al. 2022). Reaction ability is the ability to react against a signal quickly and effectively. An auto-dynamic reflex movement is the quality of reaction (Singh, L.T., & Singh 2024). Reaction speed is also defined as an individual's ability to respond to a stimulus in the shortest possible time (Lubis 2020). The Whole-Body Reaction Test is a tool for measuring the speed of the body's reaction to visual or auditory stimuli. When the sample's gaze moves towards the sensor that will produce light, as soon as the light turns on, the sample immediately responds by spreading both legs or jumping to the left or right (Sinaga et al., 2024).

Prior research indicates the effectiveness of agility-based drills, such as shuttle runs and skipping, in improving speed and coordination among badminton players (Suwardi et al., 2024). Players must show reaction speed and accuracy when hitting the shuttlecock as well as the intelligence to choose the right strategy to defeat their opponent (Kuswanti et al. 2024).

Research on the influence of skipping rope exercises on reaction speed between groups of athletes and non-athletes in badminton is still limited. Therefore, further research is needed to determine the most effective training methods in optimizing speed and reaction between badminton athletes and non-athletes. Research conducted by (Nofiansyah et al., 2024) showed a significant influence on the agility of badminton athletes, although it has not specifically measured the aspect of reaction speed. Research by (Syauki, Yunanto, and Maesaroh 2021) evaluated skipping in karate without addressing reaction performance.

Hence, this study aims to explore the effectiveness of skipping rope training in enhancing both speed and reaction time among young female badminton players and to assess whether athletes benefit more from such training than non-athletes.

Materials and Methods

Study participants

This study involved a total of 20 female adolescent under the age of 15 (U15), consisting of two distinct groups:

1. Athlete group (n=10): athletes at PB Ngudi Berkah. These participants had been

regularly performing skipping rope exercises at least three time of week, with a session duration of 15-20 minutes, for a minimum of four consecutive weeks prior to the study.
2. Non-athlete group (n=10): female students from SMP Taman Dewasa who did not participants in structured sports training and did not engage in skipping rope exercises.

Participants were selected using purposive sampling, with inclusion criteria based on the presence or absence of regular skipping rope activity. The purpose of selecting these groups was to compare physical performance outcomes based on habitual skipping rope practice.

Study organization

This research adopted a quantitative, comparative design aimed at examining the differences between adolescent athletes and non-athletes. Which is research intended to compare one sample group with another, and a quantitative descriptive method with a comparative research approach, which is a type of research that compares one sample group with another sample group based on certain variables or measurements (Zayu, Herman, and Vitri 2023). Although they weren't done during the trial, skipping rope activities helped to differentiate the groups. Data was gathered using Whole Body Reaction to gauge reaction and a 20-meter sprint to gauge speed.

Skipping rope workouts are the study's independent variable, and speed and reaction are its dependent variables. 1. A 20-meter run test with a validity of 0.538 and reliability of 0.637 is one of the tools utilized in this investigation (Rosalina and Janah 2024). 2. Whole Body Reaction, a reaction speed test with a reliability of 0.93 and a validity of 0.607 (Pratama et al., 2025).

Each participant completed one sprint trial, with time recorded in seconds. Two test trials were conducted for reaction time, and the fastest result was used.

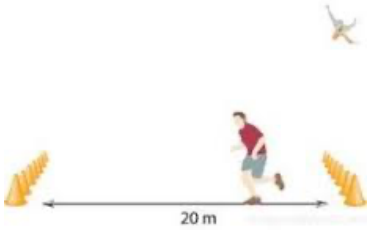

Figure 1. 20 meter run

Figure 1. *Whole Body Reaction*

The independent variable in this study is jump rope training, while the dependent variables are speed and reaction.

Statistical analysis

Data analysis was conducted using SPSS version 25. Descriptive statistics (mean and standard deviation) were calculated. The Shapiro–Wilk test assessed data normality. Independent samples t-tests were applied for normally distributed and homogeneous data; otherwise, the Mann–Whitney U test was used

Results

The results of this study were obtained and presented in a table and explained in tabular form with calculations showing the mean, standard deviation, maximum value, and minimum value.

Table 1. Descriptive Statistic

Group		Sprint 20m	Whole Body Reaction
Group of athletes	Mean	3.7650	.30560
	N	10	10
	Std. dev	.29636	.019506
	Minimum	3.31	.277
	Maximum	4.10	.330
	% of Total N	50.0%	50.0%
Group of non - athletes	Mean	4.4020	.48960
	N	10	10
	Std. dev	.22982	.111624
	Minimum	4.09	.328
	Maximum	4.90	.635
	% of Total N	50.0%	50.0%
Total	Mean	4.0835	.39760
	N	20	20
	Std. dev	.41642	.122441
	Minimum	3.31	.277
	Maximum	4.90	.635
	% of Total N	100.0%	100.0%

Table 1 presents sample data consisting of 20 individuals, with 10 in the non-athlete group and 10 in the athlete group. The athlete group shows superior performance compared to the non-athlete group in terms of speed and reaction. For speed (20m Sprint), the athletes' mean score was 3,7650, with a standard deviation of ,29636, a minimum score of 3,31, and a maximum score of 4.10. Meanwhile, non-athletes obtained a mean score of 4.4020, a standard deviation of ,22982, a minimum score of 4,09, and a maximum score of 4,90.

In terms of reaction (Whole Body Reaction), athletes have a mean value of 0.30560, a standard deviation of 0.019506, a minimum value of 0.277, and a maximum value of 0.330. On the other hand, non-athletes showed a mean of 0.39760, a standard deviation of 0.122441, a minimum value of 0.227, and a maximum value of 0.635.

The overall speed of athletes and non-athletes (20m Sprint) has a mean value of 4.0835, a standard deviation of 0.41642, a minimum value of 3.31, and a maximum value of 4.90, while the reaction (Whole Body Reaction) shows a mean value of 0.39760, a standard deviation of 0.122441, a minimum value of 0.227, and a maximum value of 0.635.

Table 2. Test of Normality

	Shapiro-Wilk			
	Group	Statistic	df	Sig.
Sprint 20m	Group of athletes	.854	10	.066
	Group of non - athletes	.919	10	.347
Whole Body Reaction	Group of athletes	.884	10	.145
	Group of non - athletes	.919	10	.353

Table 2 shows the output results of the normality test using the Shapiro-Wilk method to analyze the distribution of speed data (20m Sprint) and reaction (Whole Body Reaction) in athlete and non-athlete groups. Shapiro–Wilk tests indicated normal data distribution ($p > .05$ for all variables).

Table 3. Levene's Test for Homogeneity of Variances

		Levene's Test for Equality of Variances			
		F	Sig.	t	df
Sprint 20m	Equal variances assumed	1.101	.308	-5.371	18
	Equal variances not assumed			-5.371	16.950
Whole Body Reaction	Equal variances assumed	18.962	.000	-5.135	18
	Equal variances not assumed			-5.135	9.549

Table 3 presents the output values of the Independent Sample t-Test for the speed variable (Sprint 20m) and reaction (Whole Body Reaction) between the athlete and non-athlete groups. The results show Reaction time: Levene's Test = 0.000 ($p < .05$); Mann–Whitney U test $p = .001 \rightarrow$ significant difference.

These results confirm that athletes demonstrated significantly better speed and reaction times than non-athletes.

Discussion

This study found statistically significant differences in speed and reaction time between athletes and non-athletes. The results align with the findings of (Yuliawan et al., 2023) who reported that coordinated and dynamic training can simultaneously enhance speed and neural responsiveness. Sport games performance is characterized by high-speed actions, while sportsmen should take quick decisions and solve the sport-specific tasks occurring during the match. Based on this assumption we can conclude that complex reaction speed, acceleration, maximum speed, speed of whole-body change of direction and agility represent the basic components of sport performance mainly in sport games (Šimonek, Horička, and Hianik 2017).

Athletes who had prior exposure to structured skipping rope training demonstrated superior performance. Skipping rope exercises enhance lower limb strength, foot coordination, and neuromuscular response, contributing to improved movement efficiency and reaction capability, which are critical for badminton performance (Ani Kurniawati, Z. Arifin 2024). Speed training correlates with an improvement in faster reaction times. This shows that a person's level of training certainly has an impact on reaction speed. A trained person with a faster reaction time compared to an untrained person is due to their readiness and concentration, as well as muscle coordination that is related to faster movement speed (Fauzi et al. 2021). To be able to improve your ability to excel in athletics, especially jumping events, athlete need to increase your strength, endurance and speed (Mandasari, Krisman Gulo, and Harahap 2024).

These findings support the hypothesis that skipping rope training can effectively be utilized in youth sports development, particularly in badminton. The disparity between athletes and non-athletes also highlights the value of structured training during early adolescence, a

sensitive period for motor development (Lengkana, Tangkudung, and Asmawi 2018). To enhance training status and reach elite performance levels, it is essential to focus on the latest advancements and innovations in sports training and its applications. A coach's success is measured by their expertise, and to maintain that success, they must continuously stay informed about new developments in the field. The purpose of training is the functional development of the body, aiming to achieve physiological adaptation through regular physical exercise in response to high demands (Qahtan and Muhsin 2025). All team athletes who are taking part in sports should have some benefits in their motor skills. This expertise is to be developed by coaching. It is a fact that endurance, agility, flexibility, strength, and balance of which are the elements used successively in aerobics and anaerobic systems which affect the performance of both individual sports and team sports (Alhowikan et al. 2022).

Conclusions

Skipping rope training positively influences both speed and reaction time in female youth badminton players. Athletes who had undergone such training outperformed their non-athlete peers, underscoring the importance of incorporating skipping exercises into regular training regimens. Future studies should explore longitudinal effects and include a broader participant base to strengthen generalizability..

Acknowledgment

Thank you to all parties who have helped the author in completing this research.

Conflict of interest

The authors declare that they have no conflicts of interest in this research.

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Information about the authors:

Fatikaha Isauraya: isaurayaf@students.unnes.ac.id, 0009-0008-9579-6676, Department of Coaching Education, Faculty of Sport Science, Universitas Neger Semarang. Indonesia

Suratman: suratman@mail.unnes, 0009-0000-0384-3109, Department of Coaching Education, Faculty of Sport Science, Universitas Neger Semarang. Indonesia

Dr. Rivan Saghita Pratama, S.Pd., M.Or.: rivan.sagitha.pratama@mail.unnes.ac.id, 0000-0002-9794-4838, Department of Coaching Education, Faculty of Sport Science, Universitas Neger Semarang. Indonesia

Cite this article as: Isauraya, Fatikaha. Suratman. Pratama, Ruvan Saghita. (2025). The Effectiveness of Jumping Rope Training on the Speed and Reaction of U-15 Female Badminton Players. *Indonesian Journal of Physical Education and Sport Science (IJPESS)*, *5*(2), 326-334. https://doi.org/10.52188/ijpess.v5i2.1256