JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 2, December 2025
DOI: 10.53863/mor.v5i2.1899
Universitas Ma'arif Nahdlatul Ulama Kebumen

Original Article Research

The Effect of Fast Feet Exercises on Students' Agility in Badminton Extracurricular Activities at SMAN 18 Garut

Agung Vicky Ardiansyah[1]*, *Z. Arifin*[1], *Azhar Ramadhana Sonjaya*[1], *Alam Hadi Kosasih*[1]

[1]*Department of Physical Education, Faculty of Islamic Education and Teacher Training, Garut Universitas Garut, Indonesia*

*email corresponding author: agungvickyard@gmail.com

Received: 03/11/2025 *Revised: 24/11/2025* *Accepted: 26/11/2025*

Abstract

Agility is an important fitness component in badminton because it determines a player's ability to change direction quickly and accurately. However, initial observations of extracurricular badminton participants at SMAN 18 Garut show that students' agility is still low, as indicated by slow responses and position changes during training. This study aimed to determine the effect of Fast Feet Exercises on improving agility among students participating in the badminton extracurricular program at SMAN 18 Garut. The research used a quasi-experimental design with a One-Group Pretest–Posttest approach. Twenty students were selected using total sampling and participated in an intervention program for six weeks (three sessions per week, 45–60 minutes per session). The Illinois Agility Test was used to assess agility before and after the intervention. Data were analyzed using descriptive statistics, the Shapiro–Wilk normality test, and the Paired Samples t-test. The results showed a significant improvement in agility after the training program, as indicated by the decrease in average completion time from 20.1 ± 1.41 seconds to 17.85 ± 0.77 seconds ($t = 8.309$; $p < 0.05$). This finding demonstrates that Fast Feet Exercises effectively enhance agility by improving neuromuscular coordination, foot speed, balance, and movement efficiency. The program also resulted in more consistent performance among participants, as reflected by the reduced standard deviation. In conclusion, Fast Feet Exercises are proven to be an effective and practical method to improve agility in school-aged athletes, particularly those engaged in sports requiring rapid directional changes, such as badminton. Future studies are recommended to include control groups and investigate the long-term effects of this training method.

Keywords: agility; fast feet exercises; badminton

How to cite:

Ardiansyah, A. V., Arifin, Z., Sonjaya, A. R., & Kosasih, A. H. (2025). The Effect of Fast Feet Exercises on Students' Agility in Badminton Extracurricular Activities at SMAN 18 Garut. *Jurnal Moderasi Olahraga, 5*(2), 361–370. https://doi.org/10.53863/mor.v5i2.1899

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 2, December 2025
DOI: 10.53863/mor.v5i2.1899
Universitas Ma'arif Nahdlatul Ulama Kebumen

1. INTRODUCTION

Sports serve as an essential medium in shaping individuals who are healthy, fit, and disciplined in character. Through sports activities, a person can develop physical abilities, motor skills, as well as mental and social aspects (Ridwan, 2024). One of the most popular sports in Indonesia is badminton, which is not only favored by the general public but also plays an important role as part of extracurricular activities in schools (Triansyah et al., 2023). The badminton extracurricular program serves as a platform for fostering and developing students' potential in sports, both for recreational and achievement-oriented purposes (Haya, 2024). At SMAN 18 Garut, badminton extracurricular activities are quite popular because they provide students with the opportunity to develop basic technical skills while improving their physical fitness. The school has even begun to encourage improvements in the quality of training so that students can participate in inter-school championships, making the need for a more systematic training program essential.

In badminton, agility is one of the key physical fitness components that significantly determines an athlete's performance (Menon et al., 2025). Agility is defined as the body's ability to change direction and position quickly and accurately without losing balance. A badminton player is required to move swiftly in various directions within a short time to anticipate and return the shuttlecock from different opponent positions. Therefore, improving agility becomes a crucial aspect in developing badminton playing skills at the student level. However, initial observations of badminton extracurricular participants at SMAN 18 Garut show that students' agility levels still vary—some are in the adequate category, while others still show slow responses when changing direction. This was evident during footwork training, where some students were still slow to move in response to the shuttlecock. This condition indicates that training has been more focused on stroke technique, while agility training has not been provided in a specific and structured manner.

In reality, based on initial observations of badminton extracurricular students at SMAN 18 Garut, it was found that some students still have relatively low agility levels. This was evident from their slow response when changing positions during practice and their difficulty in quickly anticipating the shuttlecock's direction. This condition indicates that the current training program mainly focuses on basic stroke techniques and has not specifically targeted agility training in a systematic manner. In fact, agility is an essential prerequisite to support the effectiveness of technical skills such as footwork, ready position, and transition between attack and defense.

One effective form of exercise to improve agility is Fast Feet Exercises (Brown & Ferrigno, 2014). This exercise is a type of light plyometric training that emphasizes foot speed, coordination, and the body's ability to react to both visual and verbal stimuli (Hansen & Kennelly, 2017). Fast Feet training can enhance neuromuscular efficiency, improve lower limb coordination, and accelerate foot reactions to changes in movement direction (Karyono & Paluris, 2022). In the context of badminton, the ability of the feet to move quickly and adapt to the shuttlecock's direction is crucial in determining the effectiveness of footwork and shot accuracy (Galpin et al., 2008).

The Fast Feet Exercise is a simple training method that can be implemented in school training sessions without the need for complex equipment. This exercise typically involves rapid foot movement patterns in place, such as fast feet shuffle, quick step, and high knee tap, performed at specific intervals to improve both speed and lower limb explosive strength. Several previous studies have shown that fast feet training can significantly enhance agility among adolescent

athletes participating in school sports activities. These findings align with research demonstrating that footwork training has a significant effect on improving agility in badminton, where the test results indicated tcount (16.0) > ttable (1.833), meaning the training was effective in enhancing the body's ability to change direction quickly and accurately (Gusliandi et al., 2020).

Furthermore, other research revealed that four weeks of Computerized Agility Training (CAT) significantly improved foot speed, reaction time, and change of direction performance. These findings further support the evidence that fast feet exercises, which emphasize quick foot movements and responses to stimuli, are also effective in improving athletes' agility (Galpin et al., 2008). However, to date, research specifically examining the effectiveness of Fast Feet Exercises in the context of extracurricular badminton at the high school level, particularly at SMAN 18 Garut, remains very limited. This gap is what makes this research urgent. Based on this background, the researcher considers it necessary to conduct a study entitled "The Effect of Fast Feet Exercises on the Agility of Students in the Badminton Extracurricular Program at SMAN 18 Garut.

2. METHOD

2.1 Participants

The population in this study included all students involved in the badminton extracurricular program at SMAN 18 Garut during this academic year. Based on data obtained from the extracurricular coach, the total number of participants was 20 students from grades X, XI, and XII. These students regularly attended badminton training sessions held within the school environment, and were therefore considered to have relatively homogeneous characteristics in terms of interest and training experience. This population was selected because it is relevant to the research objective, namely to examine the effect of fast feet exercises on improving agility, which is one of the key components of badminton performance.

This study was determined using total sampling technique, in which all members of the population were involved as research participants (Creswell & Creswell, 2017). Thus, the total sample consisted of 20 students. This technique was chosen because the population size was relatively small, allowing the entire group to be included without compromising data accuracy. All participants in the sample underwent a training intervention consisting of Fast Feet Exercises over the research period, following a structured training program. Prior to the intervention, participants took a pretest using the Illinois Agility Test (IAT) to measure their initial agility level. After completing the series of exercises, a posttest was administered using the same instrument to determine whether there was an improvement in agility following the intervention. By involving all 20 students as research participants, the study aims to provide a comprehensive overview of the effectiveness of Fast Feet Exercises in enhancing the agility of badminton extracurricular students at SMAN 18 Garut.

2.2 Research Design

This study used a quasi-experimental design utilizing the One-Group Pretest–Posttest Design (Creswell & Creswell, 2017). This design is commonly used when researchers want to determine the effect of a treatment but do not have a comparison group (control). This means that the same group is measured before and after the treatment is administered, so that any changes that occur can be observed as a direct result of the treatment. In this study, all participants were

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 2, December 2025
DOI: 10.53863/mor.v5i2.1899
Universitas Ma'arif Nahdlatul Ulama Kebumen

tested in a pretest to measure their initial agility, then given a Fast Feet training intervention over a specific period, followed by a posttest to assess changes in agility resulting from the intervention. This design aims to determine whether there is a change in the average agility after the treatment. Next, to provide a deeper understanding, the author created the following figure:

Figure 1.

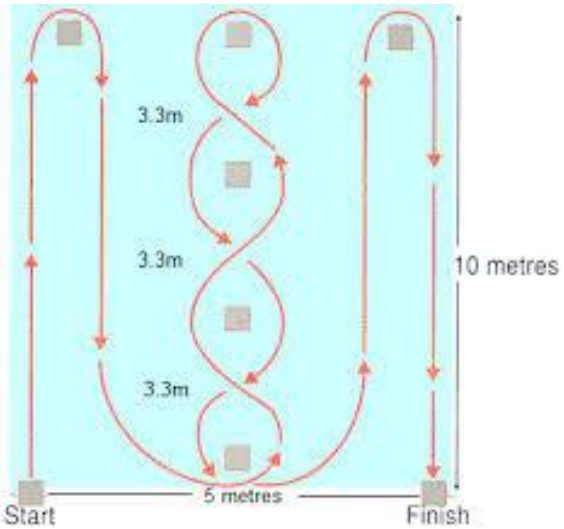
One-Group Pretest–Posttest Design

2.3 Instruments

The instrument used in this study was the Illinois Agility Run Test. This test has a validity coefficient of 0.31, this means that the Illinois Agility Runt test has a low to moderate level of validity. Although its value is not particularly high, this instrument can still be used as a measure of agility. The test also has a reliability coefficient of 0.96, which reflects a high degree of consistency or stability in its results (Hachana et al., 2013). The steps for implementing the test are as follows: each participant begins by sprinting forward and passing around a series of cones, then returns to the starting point, followed by a zigzag run through cones arranged in a specific pattern. The participant then turns back, runs forward again through the cones, and finally sprints to the finish line (see Figure 3). The attempt is considered invalid if the participant fails to follow the designated direction, knocks over, or displaces any of the cones during the test.

Figure 2.

Illinois Agility Run Test



2.4 Procedures

The intervention program in this study was conducted over a period of six weeks with a training frequency of three sessions per week (Putera et al., 2022), on non-consecutive days (Yang, 2012). Each session lasted approximately 60 minutes (Krakan et al., 2020), and followed a structured format designed to systematically develop agility through the Fast Feet Exercises

program. The session began with a 10-minute dynamic warm-up (Powers & Howley, 2021), which included light jogging, dynamic stretching, and hip and ankle mobility exercises to prepare the body for movement and reduce the risk of injury (Behm et al., 2023). This was followed by 15 minutes of basic Fast Feet technique training, including fast feet shuffle (3 sets × 30 seconds, with 30-second rest), high knee taps (3 sets × 20 steps), and quick step drills performed forward and backward over a 10-meter distance (3 repetitions). Next, participants performed 15 minutes of ladder and cone drills, such as two-in two-out, lateral quick steps, and other progressive variations, performed in 3 sets of 6 sequences each. The following 15-minute segment focused on transferring agility skills into badminton-specific movements, such as zigzag footwork combined with target strikes and front–back sprints followed by recovery movements, simulating real game conditions. The session concluded with a 5-minute cooldown and reflection period to aid recovery and evaluate individual performance (Powers & Howley, 2021). The training progression was organized into three phases: Weeks 1–2 focused on familiarization and light intensity emphasizing proper technique; Weeks 3–4 introduced moderate intensity with increased speed variation and multidirectional movements; and Weeks 5–6 emphasized high intensity through competitive, timed drills and the transfer of skills into game-like situations (Bompa & Buzzichelli, 2019).

2.5 Data Analysis

Data analysis in this study was conducted to determine the effect of Fast Feet Exercises on the agility of badminton extracurricular students at SMAN 18 Garut. First, a descriptive analysis was conducted to observe changes in agility before and after the intervention, which included calculating the mean, standard deviation, and the highest and lowest values. Next, a Shapiro-Wilk normality test was conducted to determine the appropriate analysis method, namely the Paired Sample t-Test if the data was normal ($p > 0.05$) or the Wilcoxon Signed-Rank Test if the data was not normal ($p < 0.05$). The hypotheses tested consisted of H_0 (no significant effect) and H_1 (significant effect), with a significance level of $\alpha = 0.05$. The test results showed $p < 0.05$, so H_0 was rejected, which means that Fast Feet Exercises had a significant effect on improving student agility.

3. RESULTS

The data in this study were obtained from the measurement of students' agility who participated in the badminton extracurricular program at SMAN 18 Garut, both before (pretest) and after (posttest) receiving the Fast Feet Exercises intervention over a six-week period. The measurement was conducted using the Illinois Agility Test, which records the time (in seconds) required to complete the agility course. This descriptive analysis aims to provide a general overview of the changes in the mean scores, total score, and standard deviation between the pretest and posttest results. The mean value represents the overall level of students' agility, while the standard deviation indicates the degree of consistency or homogeneity among participants' performances. The descriptive statistics results from the pretest and posttest agility data are presented in Table 1.

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 2, December 2025
DOI: 10.53863/mor.v5i2.1899
Universitas Ma'arif Nahdlatul Ulama Kebumen

Table 1.

Descriptive Data

Variabel	Source Statistic	Preetest	Posttest
Agility	N	20	20
	M	20,1	17,85
	ΣX	402	357,07
	$\boldsymbol{\sigma}$	1,41	0,77

Source: Primary Data

Based on the descriptive data above, it can be seen that the decrease in the average time from 20.1 ± 1.41 seconds to 17.85 ± 0.77 seconds indicates an improvement in students' agility after undergoing the Fast Feet Exercises training program. This suggests that the training program, which emphasizes quick foot movements, directional changes, and coordination, effectively enhances motor abilities such as quick reaction, dynamic balance, and speed of body repositioning — all of which are key components of agility. In addition, the reduction in the standard deviation (σ) from 1.41 to 0.77 shows that the posttest results became more homogeneous, meaning that students' agility levels after the training were more consistent compared to before the intervention. Thus, descriptively, it can be concluded that Fast Feet Exercises had a positive effect on improving the agility of students participating in the badminton extracurricular program at SMAN 18 Garut. This finding is consistent with theoretical explanations stating that training programs emphasizing rapid foot movements and quick directional changes can activate the neuromuscular system and improve movement efficiency, thereby reducing the completion time in the Illinois Agility Test.

Before conducting further analysis, a normality test was performed to ensure that the pretest and posttest data were normally distributed. This test aims to determine whether the data meet the basic assumptions required for parametric statistical analysis. Therefore, the results of the normality test serve as the basis for selecting the appropriate statistical test in the subsequent analysis. The results of the normality test are shown in Table 2.

Table 2.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest (seconds)	.107	20	.200*	.965	20	.655
Posttest (seconds)	.132	20	.200*	.947	20	.318

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 2, December 2025
DOI: 10.53863/mor.v5i2.1899
Universitas Ma'arif Nahdlatul Ulama Kebumen

The Shapiro–Wilk normality test results showed that the pretest (p = 0.655) and posttest (p = 0.318) significance values were > 0.05, indicating that the Illinois Agility Test data were normally distributed. Therefore, further analysis used a Paired Sample t-Test to determine significant differences between the pretest and posttest results after the Fast Feet Exercises intervention.

In the next stage, the data analysis results used a Paired Samples t-test to examine the differences in agility scores before (pretest) and after (posttest) the Fast Foot Training training. The results are shown in Table 3, as follows:

Table 3.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest – Posttest (seconds)	2.24650	1.20906	.27035	1.68064	2.81236	8.309	19	.000

Source: Primary Data

The results of the hypothesis testing are presented below. Based on the results of the Paired Sample t-test, the t-value obtained was 8.309 with a significance value (two-tailed Sig.) = 0.000 < 0.05, indicating a significant difference between the Illinois Agility Test times before and after the intervention. The average difference of 2.25 seconds indicates that participants completed the test faster than the previous test. This finding suggests that the Fast Feet Exercises were effective in improving the agility of students participating in badminton extracurricular activities at SMAN 18 Garut. The improvement can be attributed to the exercises stimulating key components of agility, including foot speed, coordination, dynamic balance, and controlled directional changes, all of which are essential elements in badminton performance.

4. DISCUSSIONS

The results of this study indicate that the Fast Feet Exercises program significantly improved the agility of extracurricular badminton students at SMAN 18 Garut, as evidenced by a decrease in Illinois Agility Test completion time from 20.1 ± 1.41 seconds in the pretest to 17.85 ± 0.77 seconds in the posttest, as well as a Paired Samples t-Test (t = 8.309, p < 0.05) that demonstrated statistical significance. These findings support the neuromuscular theory that repetitive training with fast movements can improve neuromuscular coordination, motor efficiency, and the ability to generate power quickly (Aslam et al., 2025; Caron et al., 2020). Repetitive dynamic movements such as fast feet shuffles, high knee taps, and ladder drills likely improve participants' ability to generate power quickly, maintain balance, and respond efficiently to changes in direction, key components of agility performance in sports (Utomo et al., 2024).

Physiologically, this increase in agility is linked to activation of the neuromuscular

system, specifically the lower extremity muscles responsible for acceleration, deceleration, and change of direction (Di Giminiani et al., 2020; Spiteri et al., 2015). Fast Feet training emphasizes rapid, short-duration movements that utilize the stretch-shortening cycle (SSC), thus over time improving neural efficiency and synchronization between the central nervous system and muscles, resulting in faster and more coordinated movements (Gaamouri et al., 2023). Furthermore, a decrease in the standard deviation from 1.41 to 0.77 indicates homogeneity in participant performance, meaning this training not only improves average performance but also reduces inter-individual variation, a crucial aspect in the development of young athletes in team or individual sports.

These findings also align with the principle of progressive overload in sports training (Bompa & Buzzichelli, 2019; G. Gregory Haff, 2016), as the six-week program is structured in stages: introduction to technique in weeks 1–2, moderate-intensity training in weeks 3–4, and high-intensity training and game simulations in weeks 5–6. This structure allows for optimal body adaptation without the risk of excessive fatigue or injury. Furthermore, the functional relevance of badminton footwork training supports the transfer of training theory, as the rapid lateral movements, sudden changes of direction, and precise body control practiced can be directly applied in real-life games (Chuang et al., 2022; Pt et al., 2023).

However, this study has several limitations, including a relatively small sample size (20 students), a one-group pretest–posttest design without a control group, and a limited intervention duration (6 weeks). Therefore, generalization of the results should be approached with caution. The practical implication of this study is that coaches or sports teachers can routinely use Fast Feet Exercises to improve students' agility, with exercises designed in stages and at appropriate intensity. Future research recommends expanding the sample size, adding a control group, extending the intervention duration, and exploring the effects of the training on other physical and cognitive variables, such as reaction time, speed, or game performance indicators.

CONCLUSIONS

The findings of this study show that Fast Feet Training effectively improves the agility of students participating in the badminton extracurricular program at SMAN 18 Garut, as indicated by the decrease in the average Illinois Agility Test completion time from 20.1 ± 1.41 seconds in the pretest to 17.85 ± 0.77 seconds in the posttest, supported by the Paired Sample t-Test result ($t = 8.309$; $p = 0.000 < 0.05$). These results demonstrate that exercises emphasizing quick foot movements, directional changes, and coordination enhance key motor components such as quick reaction, dynamic balance, and body repositioning speed. In practice, the Fast Feet Exercises program can be routinely integrated into badminton training sessions to further develop students' agility, particularly in improving footwork effectiveness and direction-change speed, with training intensity and progression adjusted to match students' abilities.

REFERENCES

Aslam, S., Habyarimana, J. D. D., & Bin, S. Y. (2025). Neuromuscular adaptations to resistance training in elite versus recreational athletes. *Frontiers in Physiology*, *16*(June), 1–17. https://doi.org/10.3389/fphys.2025.1598149

Behm, D. G., Alizadeh, S., Daneshjoo, A., & Konrad, A. (2023). Potential Effects of Dynamic Stretching on Injury Incidence of Athletes: A Narrative Review of Risk Factors. *Sports*

Medicine, *53*(7), 1359–1373. https://doi.org/10.1007/s40279-023-01847-8

Bompa, T. O., & Buzzichelli, C. A. (2019). *Peridization: Theory and Methodology of Training*. Human Kinetics.

Brown, L., & Ferrigno, V. (2014). *Training for speed, agility, and quickness, 3E*. Human Kinetics.

Caron, K. E., Burr, J. F., & Power, G. A. (2020). The Effect of a Stretch-Shortening Cycle on Muscle Activation and Muscle Oxygen Consumption: A Study of History-Dependence. *Journal of Strength and Conditioning Research*, *34*(11), 3139–3148. https://doi.org/10.1519/JSC.0000000000003815

Chuang, C., Hung, M., Chang, C., Wang, Y., & Lin, K. (2022). applied sciences Effects of Agility Training on Skill-Related Physical Capabilities in Young Volleyball Players. *Applied Sciences*. https://doi.org/https://doi.org/10.3390/app12041904

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Di Giminiani, R., Giovannelli, A., Capuano, L., Izzicupo, P., Di Blasio, A., & Masedu, F. (2020). Neuromuscular Strategies in Stretch–Shortening Exercises with Increasing Drop Heights: The Role of Muscle Coactivation in Leg Stiffness and Power Propulsion. *International Journal of Environmental Research and Public Health*, *17*(22), 8647. https://doi.org/10.3390/ijerph17228647

G. Gregory Haff. (2016). Periodization. In G. Gregory Haff & N. Travis Triplett (Ed.), *Essentials of strength training and conditioning* (Fourth Edi, pp. 583–639). https://linkinghub.elsevier.com/retrieve/pii/S0031940605661202

Gaamouri, N., Hammami, M., Cherni, Y., Rosemann, T., Knechtle, B., Chelly, M. S., & van den Tillaar, R. (2023). The effects of 10-week plyometric training program on athletic performance in youth female handball players. *Frontiers in Sports and Active Living*, *5*(July), 1–10. https://doi.org/10.3389/fspor.2023.1193026

Galpin, A. J., Li, Y., Lohnes, C. A., & Schilling, B. K. (2008). A 4-Week Choice Foot Speed and Choice Reaction Training Program Improves Agility in Previously Non-Agility Trained, but Active Men and Women. *Journal of Strength and Conditioning Research*, *22*(6), 1901–1907. https://doi.org/10.1519/JSC.0b013e3181887e3f

Gusliandi, F., Ramadi, Juita, A., & Welis, W. (2020). The Effect of Footwork Exercise on Agility in Badminton. *Proceedings of the 1st Progress in Social Science, Humanities and Education Research Symposium (PSSHERS 2019)*, *464*(Psshers 2019), 835–838. https://doi.org/10.2991/assehr.k.200824.186

Hachana, Y., Chaabène, H., Nabli, M. A., Attia, A., Moualhi, J., Farhat, N., & Elloumi, M. (2013). Test-Retest Reliability, Criterion-Related Validity, and Minimal Detectable Change of the Illinois Agility Test in Male Team Sport Athletes. *Journal of Strength and Conditioning Research*, *27*(10), 2752–2759. https://doi.org/10.1519/JSC.0b013e3182890ac3

Hansen, D., & Kennelly, S. (2017). *Plyometric anatomy*. Human Kinetics.

Haya, R. (2024). Implementation of Extracurricular Tan Activities in Developing Interest and Students ' Talents. *Unisan Jurnal: Journal of Management and Education*, *03*(07), 889–

897.

Karyono, T. H., & Paluris, D. S. (2022). Pengaruh Latihan Basic Movement Berpindah Tempat Terhadap Kelincahan Atlet Bulu Tangkis. *Jorpres (Jurnal Olahraga Prestasi)*, *18*(1), 17–21. https://doi.org/10.21831/jorpres.v18i1.48381

Krakan, I., Milanovic, L., & Belcic, I. (2020). Effects of Plyometric and Repeated Sprint Training on Physical Performance. *Sports*, *8*(7), 91. https://doi.org/10.3390/sports8070091

Powers, S. K., & Howley, E. T. (2021). *Exercise Physiology : Theory and Application to Fitness and Performance Exercise Metabolism*. McGraw Hill LLC.

Pt, B. R., Pt, C. B., & Bhura, P. (2023). Effect of footwork exercises on agility and balance among badminton players of Vadodara : A pilot study. *International Journal of Physical Education, Sports and Health*, *10*(4), 140–145. https://doi.org/10.22271/kheljournal.2023.v10.i4b.3020

Putera, S. H. P., Setijono, H., Wiriawan, O., Muhammad, H. N., & Hariyanto, A. (2022). The Effect of Six-Week Plyometric Training on Enhancing Sports Performance of Adolescent Students. *Physical Education Theory and Methodology*, *22*(3s), S37–S44. https://doi.org/10.17309/tmfv.2022.3s.05

Ridwan. (2024). The Influence of Early Childhood Sports upon the Social Development of on Individual. *(SIJSE) Siber International Journal of Sport Education*, *1*(3), 89–97. https://doi.org/https://doi.org/10.38035/sijse.v1i3

Spiteri, T., Newton, R. U., & Nimphius, S. (2015). Neuromuscular strategies contributing to faster multidirectional agility performance. *Journal of Electromyography and Kinesiology*, *25*(4), 629–636. https://doi.org/10.1016/j.jelekin.2015.04.009

Triansyah, Y., Suharjana, S., & Rahmatullah, M. I. (2023). Advances in Health and Exercise The influence of exercise and coordination methods hand eye coordination on the accuracy of badminton service. *Adv Health Exerc*, *3*(2), 38–45.

Utomo, A. A. B., Nurhasan, N., Wiriawan, O., & Muhammad, H. N. (2024). The Effect of Mixed Method Training Circuit Training Ladder Drill on Agility and Speed Run. *International Journal of Emerging Research and Review*, *2*(1), 000063. https://doi.org/10.56707/ijoerar.v2i1.63

Yang, V. H. et. al. (2012). Plyometric and Speed Training. In M. H. Coburn, J. W., & Malek (Ed.), *NSCA'S Essentials of Personal Training*. Human Kinetics.