INDONESIAN JOURNAL OF SPORT MANAGEMENT
Department of Physical Education, Universitas Majalengka, Indonesia
ISSN 2776-706X.

Effectiveness of Left-Handed Training on Topspin Accuracy in Right-Hand Dominant Table Tennis Players

Indah Mega Utami[1A-E*], Suratman[2B-D]

[12]Sports Coaching Education Study Program, Semarang State University, Semarang

ABSTRACT

Forehand topspin is one of the most important offensive techniques in table tennis, because it has a dominant role in controlling the game and determining the outcome of the match. However, in the adolescent age group, especially athletes who are still in the coaching stage, the ability to perform forehand topspin is often not optimal, especially in terms of control and accuracy. This study aims to examine the effect of multiball training using non-dominant (left) hands on improving forehand topspin accuracy in right-handed dominant adolescent table tennis athletes. The research used a quasi-experimental one-group pretest-posttest approach. The sample consisted of 20 U-15 male athletes from Club Hebat Semarang, selected through purposive sampling technique based on age and skill level. The intervention was conducted for four weeks (May 9-June 4, 2025), as many as 12 sessions of left-handed multiball training with a duration of 60 minutes each, using a linear progression model. The research instrument used a topspin accuracy test with a validity of 0.44 and reliability of 0.63. Data analysis was conducted using SPSS version 26. Levene's test showed homogeneous data ($p = 0.387$), and a paired t-test showed a significant improvement between pretest and post-test scores (mean score increased from 29.95 ± 4.28 to 44.85 ± 5.13; $t = -7.786$; $df = 19$; $p = 0.000$; Cohen's $d = 2.97$). This improvement indicates a very large and practically meaningful training effect. Left-hand multiball training proved effective in enhancing forehand topspin accuracy in right-dominant adolescent players. Coaches integrate non-dominant hand drills at least three times a week as part of the basic technique program to improve the bilateral coordination ability and offensive stroke quality of young players.

Keywords: Non-dominant limb training; multiball training; forehand topspin; motor coordination; table tennis performance

Corresponding author:

*Indah Mega Utami, Faculty of Sports Science, Sports Coaching Education Study Program, Semarang State University, Gunung Pati, Semarang, Indonesia. Postal Code. 50229 Email: indahmegautami09@students.unnes.ac.id

Article History:

Submitted: June, 2025
Accepted: August, 2025
Published: August, 2025

Authors' contribution:

A) Conception and design of the study;
B) Acquisition of data;
C) Analysis and interpretation of data;
D) Manuscript preparation;
E) Obtaining funding.

Cite this article:

Utami, I. M., & Suratman. (2025). Effectiveness of Left-Handed Training on Topspin Accuracy in Right-Hand Dominant Table Tennis Players. *Indonesian Journal of Sport Management, Vol.* 5(3), 729-737. https://doi.org/10.31949/ijsm.v5i3.13862

INTRODUCTION

Table tennis is globally popular sport with ever-increasing participation at both school and university levels (Nurhasana & Asmuddin, 2022). Table tennis can be practiced by anyone, regardless of gender, age, male or female, young or old, everyone can do it does not require a large place, the tools used are light and easy to obtain, the equipment also varies so that it is affordable by all circles of society, this game can also be played at any time, namely it can be played in the morning or at night (Pranata et al., 2024). Table tennis doesn't require a lot of space, a bat, a ball, and a net (Sahabuddin et al., 2022). Table tennis involves two or four players participating in each match (Wandasa Dharma et al., 2021). Table tennis matches are usually played in regional and national championships as well as events organized by educational institutions (Kadeira, 2021).

The basic techniques of table tennis that the grip, strokes, and footwork employed in the game must be perfected (Subagja et al., 2020). Tennis at the table has the most dominant attacking stroke, which is the forehand topspin technique, used to score points for

attacking players (Ratna et al., 2023). Topspin forehand is also viewed as the most effective stroke; it is a complex skill, and multi-joint movement performed in proximal to distal sequences, where several muscles work in different phases and different ways within a coordinated kinematic series (Alkhawaldeh, 2022). At 34% of all strokes and 60% of all forehand strokes, forehand topspin is the most common offensive stroke in table tennis. This demonstrates how the forehand topspin stroke significantly affects match outcomes (Podungge & Ibnu Haryanto, 2023). The technical skill of table tennis is one of the most crucial factors that determine the level of players, especially in high-level performance (Xing et al., 2022). The game of table tennis is one of the fastest sports, in which movement technique (strokes and their combinations, footwork, etc.) is essential for reaching the championship level (Bańkosz & Winiarski, 2025).

The attack-focused professional players and the great majority of the players who participate in international competitions use the forehand topspin attack in order to imprint speed and special effects to the ball, putting the adversary in difficulty and favoring the increase of the chances to win the point (Iordan et al., 2020). Accurate topspin execution plays a pivotal role in table tennis, allowing players to finely control the ball and dictate the pace of the game. The ability to consistently deliver precise topspin strokes frequently dictates match outcomes, especially in competitive settings (Haryanto et al., 2024). Topspin training is very important to understand how to do it (Irmawati, 2020), Topspin training requires directed, organized, and systematic coaching, as well as consistent practice (Sudirman et al., 2024). Several training methods, including multiball drills, shadow practice, and return board use, have been recommended to improve topspin execution (Syamsuddin et al., 2020).

Traditionally, coaching emphasizes the dominant hand in developing topspin technique. However, recent studies suggest that incorporating non-dominant hand training (e.g., left-hand drills for right-hand dominant players) may enhance neuromuscular balance, cross-lateral coordination, and motor learning. In sports science, such cross-education effects where training one limb can positively impact the other are well-documented, yet remain underexplored in table tennis (Alkhawaldeh, 2022). Left-handed training may provide untapped benefits to right-handed dominant players by improving proprioception, bilateral coordination and kinesthetic awareness, ultimately leading to better topspin control. Despite these possibilities, little empirical evidence exists to validate this approach in racquet sports, especially at the specific skill level (Tousi et al., 2017).

To get maximum results in achieving achievements, it is necessary to pay attention to table tennis, starting from physical conditions, techniques, tactics, and mental, as well as other supporters ranging from interest, talent, and motivation in sports (Zafira et al., 2024). Performance sports are intended to improve athletes' abilities and potential (Setyawan et al., 2024). Coaching requires an organization that can develop athletes into reliable athletes, in addition, there are also facilities and infrastructure along with supporting tools or facilities that support the enthusiasm of each athlete (Harahap & Nugroho, 2024). In order to get optimal performance in the Table Tennis championship, it requires good physical condition so that an athlete can reach the peak of his performance in a match (Tumaloto et al., 2024). This, this study aimed to investigate the effectiveness of left-handed training on topspin technique accuracy in right-handed dominant table tennis players.

METHOD

This study uses the one-group pretest-post-test quasi-experimental method. Experimental research is a type of research aimed at finding causal relationships between independent and dependent variables, where the independent variable is deliberately manipulated and modified by the researcher (Abraham & Supriyati, 2022). The sample consisted of 20 male U-15 athletes from Club Hebat Semarang, all identified as right-hand dominant. Participants were selected using purposive sampling based on age and skill level.

The type of research

A one-group pre-test post-test quasi-experimental approach was used in this study to assess how left-hand training affected the accuracy of forehand topspin.

The time and location

This research was conducted at the Table Tennis Club in Hebat Semarang served as the site of this study., Central Java. Conducted 12 times over 4 weeks, using a linear training model. Starting from May 9, 2025, until June 4, 2025.

The goals or target

To determine whether there is a significant improvement with multiball training using the left hand on right-handed table tennis players in terms of topspin results. The purpose of the training is to determine that there is no significant difference in the way training is initiated using the more dominant body parts. However, with the less dominant body parts, such as the left hand or left foot, both can learn in the same way.

Research procedures

Pre- and post-tests were conducted under standardized conditions. Prior to testing, participants underwent a 15-minute warm-up. During each test, 20 topspin shots were performed and evaluated by trained scorers. Athletes participated in 12 training sessions over four weeks (3 sessions/week). The intervention involved structured multiball training performed exclusively with the non-dominant (left) hand. Each session lasted 60 minutes and followed a linear progression model.

Instruments

The accuracy of forehand topspin was measured using a test developed by (Dwi Meilinda et al., 2022) with a reported validity of 0.44 and reliability of 0.63. Participants attempted to direct 20 topspin shots into designated target zones, with scores ranging from 2–5 points per shot based on placement accuracy.

Data collection techniques

Two testing phases were used in this study's data collection methodology. The first stage is the initial data collection (pre-test) conducted before the training program begins. This pre-test uses a forehand topspin accuracy test to assess the athletes' initial skill level. After four weeks of multiball training treatment, the second stage was conducted with a post-test using the forehand topspin accuracy test to assess the improvement in the athletes' skills. Both tests were conducted at the Hebat Table Tennis Club in Semarang, Central Java.

Data analysis techniques

Data were analysed using SPSS version 26. Normality and homogeneity were evaluated using the Shapiro-Wilk and Levene tests. To identify significant changes between the pre- and post-test findings, a paired-samples t-test was employed (α = 0.05) (Akhiroh & Yudhistira, 2025)

RESULTS AND DISCUSSION

Findings

The findings of this study have been obtained and presented in a table with data calculations including mean, standard deviation, maximum, and minimum values from the pretest and post-test analysis as follows:

Table 1. Descriptive Statistics of Forehand Topspin Accuracy

		Pretest Forehand Topspin	Posttest Forehand Topspin
N	Valid	20	20
	Missing	0	0
Mean		29.95	44.85
Median		29.00	43.00
Std. Deviation		7.395	8.468
Range		35	33
Minimum		20	34
Maximum		55	67

The forehand executed in 20 trials produced a minimum score of 20, a maximum score of 55, an average of 29.95, a median of 29.00, and a standard deviation of 7.395, according to the findings of the pretest statistical computations. The forehand results from 20 trials, on the other hand, were obtained using the post-test static computation. The findings showed a minimum score of 34, a maximum score of 67, an average of 44.85, a median of 43.00, and a standard deviation of 8.468.

Table 2. Normality Test of Pretest and Post-test Forehand Accuracy Topspin

	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest Forehand topspin	.818	20	.002
Posttest Forehand topspin	.916	20	.082

a. Lilliefors Significance Correction

The pre-test sig value was 0.002, which was determined by the Shapiro-Wilk technique results of the normalcy test. In the meantime,.082 was the post-test sig value. The Shapiro-Wilk technique concludes that the pretest and post-test scores are regularly distributed because the significant values of both datasets are higher than 0.05.

Table 3. Homogeneity Pre-test and Post-test Accuracy of Forehand Topspin

		Levene Statistic	df1	df2	Sig.
Results	Based on Mean	.764	1	38	.387
	Based on Median	.582	1	38	.450
	Based on Median and with adjusted df	.582	1	37.891	.450
	Based on trimmed mean	.749	1	38	.392

Table 3 Levene's Test confirmed data homogeneity (p = 0.387). Therefore, since all are homogeneous, the data analysis can proceed with the t-test 2 (paired sample t-test).

Table 1. Paired Samples T-Test Pretest and Post-test of Forehand Topspin Accuracy

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pretest Forehand topspin - Posttest Forehand topspin	-14.900	8.559	1.914	-18.906	-10.894	-7.786	19	.000

Table 4 of the "Paired Samples T-Test" output above shows that the average results of the forehand topspin pretest and post-test among table tennis athletes differ significantly, with a sig (2-tailed) value of 0.000 < 0.05.

Discussion

The findings confirm that left-hand training can positively influence forehand topspin performance in right-handed players. This aligns with previous research emphasizing the role of non-dominant limb training in enhancing neuromuscular control and movement precision (Winiarski et al., 2021) which states that importance of the non-dominant hand in stability and movement coordination during forehand topspin stroke.

The improvement observed may be attributed to the motor learning principle that novel and challenging stimuli, such as using the non-dominant hand, foster new neural adaptations. Additionally, the structured multiball training provided repetitive, focused practice, known to enhance stroke precision and consistency (Setiawan & Andrijanto, 2019). A well-organized and structured training program will succeed if everything supports the achievement of the athlete's performance; varied and structured training methods can significantly enhance technical skills in young athletes (Lazim et al., 2018). Table tennis achievements cannot be attained speculatively, but must be achieved through intensive training with the correct training program (Dwi Meilinda et al., 2022). If a player wants to perform basic table tennis strokes correctly, smoothly, and successfully, whether it is an attacking stroke or a defensive stroke (Hendrawan et al., 2022). The study highlights the importance of varied, progressive training methods to improve youth athletes' technical competencies. The manual multiball method is very good for improving the accuracy of forehand drive shots (Muh. Gaus Isnandar Jamaluddin, 2022).

Shot accuracy serves the dual purposes of finishing a game (rally) or earning a winning point by forcing the opponent to run in order to reach the ball that is far out of reach (opening the side court) (Budi et al., 2020). The multiball training method is the training technique utilized to increase the forehand topspin shot's accuracy, according to the findings that have been described (Ratna et al., 2023). It can be concluded that this topspin is very effective in scoring points (Khairi et al., 2022). The training method applied is the multiball training method has its own characteristics in the application of its steps, then in its application the training method also has an influence on improving table tennis forehand drive skills (Erlangga et al., 2022).

CONCLUSION

This study demonstrates that left-hand multiball training significantly enhances forehand topspin accuracy in right-hand dominant U-15 table tennis players. The results support incorporating non-dominant limb exercises into technical training regimens to stimulate bilateral motor coordination and performance adaptation.

Practical Implications: Coaches are encouraged to integrate non-dominant hand drills into regular practice sessions as a strategy to improve symmetry, coordination, and overall stroke accuracy in young athletes.

AKCNKOWLWDGEMENT

The author expresses gratitude to the Great Semarang Table Tennis Club for granting permission and support during the research process. Appreciation is also extended to the athletes who participated as research subjects. In addition, to the supervising lecturers and other parties who have provided assistance, both morally and technically, in the completion of this research.

CONFLICT OF INTEREST

The findings and interpretation of this study could not be influenced by any potential conflicts of interest, according to the authors.

FUNDING

Governmental, commercial, or nonprofit organizations did not provide support for this study. All funding for the activities was independently provided by the author. This research was conducted as part of fulfilling academic duties in order to complete studies and obtain a degree at the current level of education.

REFERENCES

Akhiroh, E. N., & Yudhistira, D. (2025). *The Influence of Tabata Training and Interval Training on VO 2max Endurance Improvement in Pencak Silat Martial Arts Athletes*. *5*(1), 91–105.

Alkhawaldeh, I. M. (2022). The Effect of Selected Kinematic Variables on the Accuracy of Topspin Forehand among Table Tennis Players. *International Journal of Human Movement and Sports Sciences*, *10*(2), 217–223. https://doi.org/10.13189/saj.2022.100212

Bańkosz, Z., & Winiarski, S. (2025). Kinematics of Topspin Stroke Combinations in Table Tennis and its Inter-Individual Variability. *Journal of Sports Science and Medicine*, *24*(2), 311–325. https://doi.org/10.52082/jssm.2025.311

Dwi Meilinda, E., Safari, I., & Sudrazat, A. (2022). Konstruksi Tes Ketepatan Forehand topspin Pada Cabang Olahraga Tenis Meja. *Jurnal Ilmu Keolahragaan Undiksha*, *10*(2), 103–109. https://doi.org/10.23887/jiku.v10i2.49882

Erlangga, D., Isna, M., Wibisana, N., Royana, I. F., Jasmani, P., Rekreasi, K. D., Pendidikan, F., & Pengetahuan, I. (2022). ROBOPAS (Robot Kipas) Pengembangan Media Latihan Multiballl Tenis Meja. *Journal of Sport Science and Fitness*, *8*(24), 49–55. https://doi.org/10.15294/jssf.v8i1.58268

Harahap, B. J., & Nugroho, A. (2024). Manajemen Pembinaan Prestasi Olahraga Tenis Meja di National Paralympic Commitee Sumatra Utara. *Management of Sport*, *3*(1), 20–26. https://doi.org/10.55081/jmos.v3i1.3287

Haryanto, J., Drenowatz, C., Picabea, J. M., Ndayisenga, J., Padli, Zarya, F., Edmizal, E., Ockta, Y., & Geantă, V. A. (2024). Self-Confidence and Cognitive Speed: Key Predictors of Topspin Accuracy in Competitive Table Tennis. *Physical Education Theory and Methodology*, *24*(6), 912–919. https://doi.org/10.17309/tmfv.2024.6.08

Hendrawan, K. T., Hamid, F., & Synthiawati, N. N. (2022). Meningkatkan Hasil Belajar Forehand Tenis Meja Menggunakan Metode Problem Solving. *JOURNAL RESPECS (Research Physical Education and Sports)*, *4*(2), 105–116. https://doi.org/https://doi.org/10.31949/respecs.v4i2.2952.

Iordan, D.-A., Mocanu, M.-D., & Mereuta, C. (2020). Topspin's Influence on the Spine in Female Juniors III in Table Tennis. *Brain. Broad Research in Artificial Intelligence and Neuroscience*, *11*(1), 125–143. https://doi.org/10.18662/brain/11.4sup1/160

Irmawati, D. A. (2020). Analisis Biomekanika Keterampilan Gerak Topspin Tenis Meja pada Klub Alaska Kota Pekalongan. *Journal of Sport Coaching and Physical Education*, *5*(1), 103–108. https://doi.org/10.15294/jscpe.v5i2.37070

Kadeira, R. (2021). Pengaruh latihan multiball terhadap ketepatan sasaran pukulan Forehand Dan Backhand Drive Pada Atlet Tenis Meja Makota Malang. *Jurnal Prestasi Olahraga*, *4*(6), 114–120.

Khairi, A., Zainur, Z., Hidayat, H., & Aulia, A. G. (2022). Survei Kemampuan Pukulan Drive Topspin dalam Permainan Tenis Meja Usia Kurang Dari 15 Tahun (U-15) Pada Atlet Putra PersatuanTenis Meja (PTM) Mandiri Kampar. *Journal Respecs*, *4*(2), 26–36. https://doi.org/10.31949/respecs.v4i2.2395

Lazim, O. K. dan, Morphology, T. C., Wylęgała, L., Morphology, T. C., Ibrahim, H. (2018). *MANAJEMEN PEMBINAAN PRESTASI CABANG OLAHRAGA TENIS MEJA DI KLUB ORMETA*. Materia Japan. http://joi.jlc.jst.go.jp/JST.Journalarchive/materia1994/44.24?from=CrossRef%250Ahttps://www.be rtelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/MT_Globalization_Report_2018.p df%250Ahttp://eprints.lse.ac.uk/43447/1/India_globali

Muh. Gaus Isnandar Jamaluddin, M. Z. A. (2022). Pengaruh Latihan Multiball Terhadap Ketepatan Forehand Drive dalam Permainan Tenis Meja pada Siswa Ekstrakulikuler SMP Negeri 2 Dangia. *Jurnal Ilmu Keolahragaan*, *1*(3), 86–95. https://doi.org/10.36709/joker.v3i2.24760

Nurhasana, N., & Asmuddin, A. (2022). Hubungan Koordinasi Mata Dan Tangan Dengan Ketepatan Servis Backspin Pada Club Persatuan Tenis Meja Amo Kota Baubau. *JOKER (Jurnal Ilmu Keolahragaan)*, *3*(3), 141. https://doi.org/10.36709/joker.v3i3.24875

Podungge, R., & Ibnu Haryanto, A. (2023). Meningkatkan Pukulan Top Spin Tenis Meja Siswa melalui Metode Praktik Lapangan. *Journal on Education*, *06*(01), 4620–4626.

Pranata, P., Aziz, I., Fardi, A., & Sari, S. N. (2024). Hubungan Kordinasi Mata Tangan Terhadap Kemampuan Pukulan Forehand Drive Dalam Olahraga Tenis Meja. *Gladiator*, *4*(2), 359–370. https://doi.org/10.24036/gltdor1013011

Ratna, A. D., Sugiarto, T., Fitriady, G., & Heynoek, F. P. (2023). Upaya Meningkatkan Pukulan Forehand Topspin Dengan Latihan Multiball Untuk Usia Pemula Atlet Tenis Meja Ptm Briliant Blitar. *Sport Science and Health*, *5*(4), 421–434.

https://doi.org/10.17977/um062v5i42023p421-434

Sahabuddin, S., Syahruddin, S., & Fadillah, A. (2022). Analisis Kekuatan Genggaman, Kelentukan Bahu Dan Daya Tahan Otot Lengan Terhadap Pukulan Forehand Dalam Permainan Tenismeja. *Riyadhoh : Jurnal Pendidikan Olahraga*, *5*(1), 58. https://doi.org/10.31602/rjpo.v5i1.6881

Satria Budi, J. A. (2020). PENGARUH METODE LATIHAN MULTIBALL TERHADAP KETEPATAN PUKULAN FOREHAND DAN BACKHAND DRIVE DALAM PERMAINAN TENIS MEJA. *Jurnal Patriot*, *2*(2), 503–513. https://doi.org/10.24036/PATRIOT.V2I1.523

Setiawan, A. P. A., & Andrijanto, D. (2019). *Profiling Atlet Pada Pukulan Dasar Tenis Meja Untuk Kegiatan Ekstrakurikuler*. Ejournal.Unesa.Ac.Id. ejournal.unesa.ac.id/index.php/jurnal- pendidikan-jasmani/article/view/38184/34974

Setyawan, H., Purwanto, S., Novita Indra, E., Prayudho, S., Vicente García-Jiménez, J., Pavlovic, R., Magdalena Nowak, A., Susanto, N., Darmawan, A., Aziz Purnomo Shidiq, A., & Susanto Susanto, N. (2024). The Differences Result In Serve Skill of Junior Tennis Players Assessed Based On Gender and Age. *Retos*, *54*, 272–278. https://doi.org/10.47197/retos.v54.102757

Subagja, D. S., Kusmaedi, N., & Komarudin, K. (2020). Erratum: Pengaruh Media Pembelajaran Dan Koordinasi Terhadap Ketepatan Forehand Top Spin Tenis Meja. *JUARA : Jurnal Olahraga*, *5*(1), 124. https://doi.org/10.33222/juara.v5i1.936

Sudirman, A., Makassar, U. N., & Makassar, K. (2024). *Pengaruh Latihan Plyometrik Terhadap Kemampuan Pukulan Forehand Topspin Dalam Pemainan Tenismeja Pada Mahasiswa FIK UNM The Effect Of Plyometric Exercises On Topspin Forehand Capability In Table Tennis Playing In FIK UNM Students*. *4*, 489–493.

Syamsuddin, N., Musfira, N., & Hammado, N. (2020). Penerapan Pembelajaran Model Latihan Shadwo dalam Permainan Tenismeja di SMA Negeri 6 Kabupaten Tana Toraja. *Dedikasi*, *22*(2), 221–229. https://doi.org/10.26858/dedikasi.v22i2.16144

Tousi, M. M., Emami, T., & Hoseini, S. M. (2017). The Effect Ofinitial Practice with Dominant and Non-Dominant Hand on Acquisition, Retention and Transfer of a Complex Motor Task. *Biosciences, Biotechnology Research Asia*, *14*(3), 1067–1074. https://doi.org/10.13005/bbra/2543

Tumaloto, E. H., Kadir, S. S., Ilham, A., & Syaputra, R. (2024). Evaluasi Program Latihan Fisik Atlet Tenis Meja. *Jambura Health and Sport Journal*, *6*(2), 155–164. https://doi.org/10.37311/jhsj.v6i2.26978

Wandasa Dharma, A. P., Zakiyullah Romdlony, M., & Surya Wibowo, A. (2021). Perancangan Sistem Pengaturan Spin Dan Kecepatan Bola Untuk Robot Pelontar Bola Tenis Meja Design of Spin and Speed Control System for Table Tennis Ball Throwing Robot. *Telkatika*, *1*(1), 2021.

Winiarski, S., Lanzoni, I. M., & Bańkosz, Z. (2021). The role of the non-playing hand during topspin forehand in table tennis. *Symmetry*, *13*(11), 1–11. https://doi.org/10.3390/sym13112054

Xing, K., Hang, L., Lu, Z., Mao, C., Kang, D., Yang, C., & Sun, Y. (2022). Biomechanical Comparison between Down-the-Line and Cross-Court Topspin Backhand in

Competitive Table Tennis. *International Journal of Environmental Research and Public Health*, *19*(9). https://doi.org/10.3390/ijerph19095146

Zafira, N., Rani, A., & Candra, D. (2024). The relationship between mental toughness, anxiety with the achievement motivation adolescent badminton athlete. *Jurnal Patriot*, 6(3), 89–96. https://doi.org/doi.org/10.24036/patriot.v%vi%i.1078