Fixed and moving target drilling methods: effects on smash results in badminton players aged 14-16 years

Métodos de perforación de objetivos fijos y móviles: efectos en los resultados de smash en jugadores de bádminton de 14 a 16 años

Authors

Didik Cahyono[1]
Muhammad Sukron Fauzi[1]
Gyta Krisdiana Cahyaningrum[1]
Naheria[1]
Hamdiana[1]
Julianur[2]
Muchamad Samsul Huda[1]
Muhamad Saiin[1]
Jeane Betty Kurnia Jusuf[2]
Dewangga Yudhistira[3]

[1] Universitas Mulawarman (Indonesia).
[2] Universitas Muhammadiyah Kalimantan Timur (Indonesia)
[3]Universitas Negeri Surabaya (Indonesia)

Corresponding author:
Muhammad Sukron Fauzi[4]

sukron.fauzi@fkip.unmul.ac.id

How to cite in APA

Sukron Fauzi, M., & yudhistira, dewangga. (2025). Fixed and moving target drilling methods: effects on smash results in badminton players aged 14-16 years . *Retos*, *68*, 1113–1120. https://doi.org/10.47197/retos.v68.115437

Abstract

Introduction: Achieving victory in badminton requires adequate skills and physicality. Smash is an important point in badminton to achieve victory. Optimizing smash performance in badminton requires the right training method. One method that is often used is fixed and moving targets. This method is believed to be able to improve badminton smash results. However, studies that examine this training method for ages 14-16 have not received special attention.
Objective: The purpose of this study was to test the effect of fixed and moving target training methods on the smash results of badminton players aged 14-16 years. Methods: The research method is an experiment with a pretest-posttest design. 20 male participants were selected by purposive sampling and ordinal pairing. The instrument is a validated smash test. Data collection techniques with observation and testing. Data analysis techniques with paired and independent samples t-test with SPSS version 23.
Results: The significance value of the pretest-posttest of each group (0.000 <0.05) that the posttest value is better. The significance value of the posttest of fixed targets and moving targets (0.01 <0.05) shows that fixed targets are better than moving targets.
Conclusion: In short, fixed and moving target training are equally good for improving smash results, but the fixed target method is better than the moving target. The implication is that both methods can be recommended training to improve smash results. However, further research is needed in the characteristics of age, level of training, and research samples, so that more comprehensive results will be obtained.

Keywords

Fixed and moving target drills, smash results of badminton players, aged 14-16 years.

Resumen

Introducción: Para ganar en bádminton se requieren habilidades y un buen estado físico. El smash es un punto clave para alcanzar la victoria. Optimizar el rendimiento del smash requiere un método de entrenamiento adecuado. Un método frecuente es el de objetivos fijos y móviles. Se cree que este método puede mejorar los resultados del smash. Sin embargo, los estudios que examinan este método de entrenamiento en jugadores de bádminton de 14 a 16 años no han recibido especial atención.
Objetivo: El propósito de este estudio fue evaluar el efecto del entrenamiento con objetivos fijos y móviles en los resultados del smash en jugadores de bádminton de 14 a 16 años.
Métodos: El método de investigación es un experimento con un diseño pretest-postest. Se seleccionaron 20 participantes masculinos mediante muestreo intencional y emparejamiento ordinal. El instrumento es una prueba de smash validada. Se utilizaron técnicas de recolección de datos de observación y experimentación. Técnicas de análisis de datos con prueba t de muestras pareadas e independientes con SPSS versión 23.
Resultados: El valor de significancia del pretest-postest de cada grupo (0,000 <0,05) que el valor del postest es mejor. El valor de significancia del postest de objetivos fijos y objetivos móviles (0,01 <0,05) muestra que los objetivos fijos son mejores que los objetivos móviles.
Conclusión: En resumen, el entrenamiento con objetivos fijos y móviles son igualmente buenos para mejorar los resultados del smash, pero el método del objetivo fijo es mejor que el objetivo móvil. La implicación es que ambos métodos pueden ser entrenamiento recomendado para mejorar los resultados del smash. Sin embargo, se necesita más investigación en las características de la edad, el nivel de entrenamiento y las muestras de investigación, para que se obtengan resultados más completos.

Palabras clave

Ejercicios con objetivos fijos y móviles: resultados espectaculares de jugadores de bádminton de 14 a 16 años.
.

Introduction

Badminton is a racket sport played with a net and a shuttlecock in which players must use a slow to fast stroke rhythm to score points (Fajar et al., 2022). One of the most important techniques in this sport is the smash, a powerful overhead stroke used to put pressure on the opponent and score points (Akbar et al., 2021). A well-executed smash combines speed and accuracy and makes it difficult for the opponent to anticipate or return the blow (Bagaskara, 2017). A good smash is one with enough accuracy and speed that the opponent cannot predict (Koike & Hashiguchi, 2014). According to Wiratama and Karyono (2017), a smash is defined as a powerful downward stroke that is executed over the head and aims to end the rally decisively (Wiratama & Karyono, 2017).

Given its central importance to the game, optimizing smash performance is critical to the development of athletes. A commonly used training strategy is the drill method, which emphasizes repetition and structured practice to reinforce specific movement patterns. The drill method described by Primayanti (2019) focuses on repetitive execution of technical movements, such as footwork and kicking, to help athletes internalize their skills through automaticity. also emphasized that drill methods facilitate the accelerated acquisition of motor skills (Intan Primayanti, 2019a). According to studies, the drill method is a movement used to accelerate the mastery of other movement techniques (Rustandi & Safitri, 2019). Two variants of this method are frequently used in practice: Drills with fixed targets and drills with moving targets. Fixed target drills involve hitting a stationary target to improve accuracy, while moving target drills simulate dynamic, unpredictable game conditions by requiring players to hit moving targets set by the coach.

Previous research has examined the comparative effects of fixed and moving target drills in different sports. Anam et al. (2018) compared the effectiveness of these drills on shooting accuracy in soccer (Anam et al., 2018), while investigated their effects on serve accuracy in volleyball (Mardiana, 2019). investigated their effects on serve accuracy in volleyball. investigated their impact on stroke accuracy (Badaru et al., 2024), evaluated their application in badminton, particularly on serve performance. However, much of this literature focuses on sports other than badminton, and the few studies examining badminton focus on technical elements other than the smash. Furthermore, the results of the different studies are inconsistent (Ivantri, 2019). However, several of the research conducted focused on volleyball, football, and martial arts. Although one study was relevant to badminton, it focused on the precision of serving approaches. Aside from that, there are still differences in research findings on the usage of fixed and moving target methods. According to Ivantri, the impact of fixed and moving target service training is identical (Ivantri, 2019). found no significant difference between fixed and moving target exercises (Badaru et al., 2024). Found moving targets to be more effective.

According to Wati et al. (2018), training methods need to be adapted to both chronological and developmental age. Players aged 14–16 are in a phase that requires systematic (Wati et al., 2018). progressive and varied training (Mulyana, 2019). In addition, individual differences must be taken into account — athletes with lower technical skills need tailored interventions to correct basic errors, while more advanced athletes can benefit from higher training intensity (Yudhistira et al., 2021).

In light of these considerations, this study addresses two gaps in the literature: the lack of research on fixed or moving target exercises related to badminton smashes and the lack of studies focusing specifically on athletes aged 14–16 years. Therefore, this study aims to investigate the effects of fixed and moving target drills on the smash performance of badminton players aged 14–16 years at Mutiara Badminton Club in Pekalongan, Central Java. The results are expected to provide practical insights for designing age-appropriate and skill-specific training interventions. The researchers hypothesize that the fixed target practice method is more effective than the moving target practice method in improving smash performance in adolescent badminton players.

Method

Participants and data collection

In this study, an experimental field trial with a two-group pretest–posttest design (Sugiyono, 2010), was conducted to investigate the effectiveness of fixed and moving target exercises on the smash performance of adolescent badminton players. A total of 20 male participants aged 14to 16 years were selected using randomization and ordinal matching (MSOP). The inclusion criteria were as follows: (1) active members of the Mutiara Pekalongan Badminton Association (PB), Central Java; (2) previous competitive experience at district or provincial level; (3) height between 160–170 cm and weight between 50–65 kg; (4) injury-free during the study period; and (5) willingness to participate in a 16-session training program, confirmed by a signed informed consent form and parental permission. Purposive sampling, while efficient for small populations with specific characteristics, carries the risk of self-selection bias. Efforts were made to minimize bias by ensuring that participants had comparable experience and physical profiles.

Procedure/Test protocol/Skill test trial/Measure/Instruments

To ensure internal validity, both groups underwent identical pretests and posttests, and the training interventions were conducted by the same trainers. Participants were randomly assigned to either the fixed-target group or the moving-target group using a matching-subject-ordinate-pairing (MSOP) procedure based on pretest smash scores to ensure equivalence between groups (Yudhistira, 2018). The treatment lasted four weeks (16 sessions), with training taking place three times a week. Each session lasted approximately 60 minutes, including warm-up, skill training and cool-down. All sessions were supervised to ensure adherence to the protocol. No external training was allowed during the intervention period. he smash accuracy test was adapted from and used to assess the accuracy of hitting a shuttlecock into five predetermined target zones on the opponent's court. Each athlete performed 10 smashes per test session. The scoring was as follows: 3 points for hitting the centre target zone, 2 for the adjacent zones and 1 for the other areas of the court. The maximum score was 30. The validity index of the instrument was 0.78 and the reliability coefficient (test-retest) was 0.81, indicating acceptable psychometric properties for use with adolescent badminton athletes (Wiratama & Karyono, 2017). To clarify, the fixed and moving target drill training program is presented in Table 1 as follows:

Table 1. Fixed and moving target training programs to optimize smash results

Fixed target drill method	
Practice Material	Exercise Dosage
Material 1: dumbbell overhead raise	Rep: 6-12-24 Set: 3 Interval: 30” Recovery: 1-2’
Material 2: underhand lob	Rep: 10-18-30 Set: 3 Interval: 30" Recovery: 1-2’
Material 3: overhead lob	Rep: 10-18-30 Set: 3 Interval: 30" Recovery: 1-2’
Material 4: drop shot	Rep: 10-18-30 Set: 3 Interval: 30" Recovery: 1-2’
Moving target drill method	
Material 1: dumbbell overhead raise	Rep: 6-12-24 Set: 3 Interval: 30" Recovery: 1-2’
Material 2: underhand lob	Rep: 20-18-60 Set: 3 Interval: 30" Recovery: 1-2’
Material 3: overhead lob	Rep: 20-18-60 Set: 3 Interval: 30"

	Recovery: 1-2’
Material 4: drop shot	Rep: 20-18-60 Set: 3 Interval: 30" Recovery: 1-2’

Description

Players are instructed to jog 5 laps of the badminton court before performing a static and dynamic warm-up in preparation for 20 minutes of core training. After the warm-up, the players are given instructions to perform core training. A total of 10 players in Group A are trained using the fixed target drill method, whereas 10 players in Group B are trained using the moving target drill method. Core training takes approximately 90 minutes. After completing the core training, the players are instructed to cool down for 10 minutes before receiving an evaluation of the exercises used in the core training so that they can improve at the next training meeting.

Data collection and analysis / Statistical analysis

The data analysis technique employed was descriptive analysis, which displayed minimum, maximum, mean, and standard deviation values. The prerequisite tests for normality and homogeneity were carried out before continuing with hypothesis testing using the paired samples t-test and the independent samples t-test with a significance level of $P<0.05$. Data analysis was assisted using the SPSS version 23 program.

Results

Descriptive Analysis Results

Table 2 shows the authors' descriptive analysis results, which include the minimum, maximum, mean, and standard deviation values.

Table 2. Description Analysis Results of Smash Ability.

Variable	N	Min	Max	Mean	Std. Dev
Fixed target drill group pretest	10	7	11	8.7	1.33749
Fixed target dill group post-test	10	10	15	12.4	1.42984
Moving target drill group pretest	10	7	11	8.5	1.26930
Moving target drill group post-test	10	9	14	11	1.56347

According to Table 1, the mean value of the fixed target drill pretest is 8.7, whereas the fixed target drill posttest is 12.4. The moving target drill pretest has a mean value of 8.5, whereas the posttest has a value of 11. Thus, the target drill posttest score was still higher than the pretest. The target drill posttest score improved compared to the pretest.

Prerequisite Test Results

The authors present the results of the prerequisite tests including normality and homogeneity tests of the data presented in Tables 3 and 4 as follows:

Table 3. Normality Prerequisite Test Results

Variable	Asymp.Sig (2-tailed)	Description
Fixed target drill group pretest	0.200	Normal
Fixed target dill group posttest	0.200	Normal
Moving target drill group pretest	0.069	Normal
Moving target drill group post-test	0.111	Normal

According to Table 3, the asymp.sig (2-tailed) value for all variables is p>0.05, indicating that the entire set of fixed and moving target variables is normally distributed.

Table 4. Homogeneity Prerequisite Test Results

Variable	Asyimp.sig(2-tailed)	Description
Fixed and moving drill posttests	0.203	Homogenous

According to Table 4, the fixed and moving target posttest drills have asymp.sig (2-tailed) values of 0.203 > 0.05, indicating that the data is homogeneously distributed. As a result, hypothesis testing can begin once the prerequisite tests have been passed.

Hypothesis Test Results

The authors provide the findings of hypothesis testing, which included both the paired and independent samples t-tests. The following Tables 5 and 6 give the results:

Table 5. Results of paired samples t-test

Variable	Asymp.sig(2-tailed)	Description
Fixed target drill pretest – Fixed target drill posttest	0.000	Significant
Moving target drill pretest – Moving target drill posttest	0.000	Significant

Based on table 5, it is obtained that in the pretest and posttest drill variables, the target still gets an asymp.sig (2-tailed) value of 0.000 <0.005, then in the pretest and posttest drill variables, the target changes to get an asym.sig (2-tailed) value of 0.000 <0.05. Therefore, between the pretest and posttest there is a significant difference that the posttest variable is better than the pretest.

Table 6. Independent samples t-test results

Variable	Asymp.sig(2-tailed)	Description
Fixed drill posttest – moving drill posttest	0.001	Significant

Table 5 shows that the fixed target pretest and posttest drill variables obtain an asymp.sig (2-tailed) value of 0.000<0.005, while the moving target pretest and posttest drill variables obtain an asym.sig(2-tailed) value of 0.000<0.05. These results indicate a considerable difference between the pretest and posttest, with the posttest variable performing better.

Discussion

The present study investigated the effects of fixed and moving target training methods on the smash performance of badminton players aged 14–16 years. The results showed statistically significant improvements in both groups from pretest to posttest, with the fixed target group achieving better posttest results. These results suggest that fixed target exercises may be more effective than moving target exercises in improving smash accuracy in adolescent badminton players.

While these findings are consistent with previous studies supporting drill-based training to improve motor performance (Hasibuan et al., 2020; Intan Primayanti, 2019b; Subagja, 2023; Wahyuni et al., 2023). They provide new insights specific to the area of badminton smash technique. This is particularly relevant for the Mutiara Pekalongan Badminton Association, where no previous studies have systematically tested these interventions. However, to fully contextualize these results, it is important to consider theoretical perspectives of motor learning and skill acquisition. According to Schmidt's schema theory and Gentile's two-stage model of motor learning, beginners benefit most from consistent, repetitive exercises that reduce variability and allow for stabilization of motor patterns (Kamali, 2018). In this sense, drills with fixed goals provide a stable and predictable environment that allows players in the early

stages of skill development to encode consistent sensory and motor information. For players aged 14 to 16, who are usually in the associative learning phase, this stability is beneficial to refine technique before moving on to more variable tasks such as those found in moving target exercises.

In addition, theories of cognitive development, such as Piaget's, suggest that adolescents at this age are transitioning to formal, operational thinking that supports the integration of more complex tactical and perceptual skills. However, when technical foundations are weak, cognitive resources may be overtaxed by variable practice, reducing learning efficiency. This may explain why the group with moving targets did not perform better than the group with fixed targets in this study (Edwards, 2012). As a result, proper training is varied and challenging, encouraging badminton athletes to improve their skills. Mastery of good smash technique is, of course, achieved through the appropriate training program (Hidayah et al., 2023).

However, the results support the idea that exercises with fixed targets are effective for developing stroke accuracy in adolescent athletes with developing motor skills. However, for athletes who have mastered basic techniques and developed faster perceptual-motor responses, drills with moving targets may be better suited to simulate the variability of real-world play and improve adaptive decision making. This supports the principle of progressive overload in youth training, starting with structured tasks and gradually increasing complexity (Bompa, 2015).

Given these results, coaches working with adolescent badminton players are advised to tailor training programs based on developmental level and focus on mastering technique through fixed drills before moving on to more dynamic, game-like conditions. Such a pedagogy is consistent with contemporary views on long-term athlete development that emphasize multilateral development between the ages of 14-16 (Hidayah & Akhiruyanto, 2023). Another study defined sport pedagogy as a method of acquiring and improving sport-specific skills (Lee et al., 2014). and reinforces the role of the coach as a facilitator of both motor and cognitive growth (Armour, 2013). Badminton achievements will come over time if training management is effective.

Conclusions

This study examined the effectiveness of fixed and moving target training methods on the smash performance of badminton players aged 14–16 years. The results showed that both training methods significantly improved smash accuracy, with the fixed target training method showing greater effectiveness. This suggests that fixed target drills, which provide a stable and predictable training environment, are more suitable for adolescent players who are still developing their technical and motor skills. From a practical perspective, coaches should prioritize fixed-goal drills when training players who are in the early to middle stages of development. These drills help athletes focus on mastering technique without the added complexity of dynamic goals. Once basic skills are solidified, players can benefit from drills with moving targets that simulate the variability and decision-making in a real game. Despite its contribution, this study has limitations, including a small sample size, male-only participants, and a single training environment. These factors limit the generalizability of the results. Future research should include a wider variety of populations and examine long-term effects on different levels of performance.In summary, fixed-target training is a practical and effective approach to improving smash results in young badminton athletes and can serve as a foundation for developing more complex skills.

Acknowledgements

The author would like to thank the club managers and athletes who have given permission for this research, so that this research can be completed properly.

Financing

No funding. All authors declare no conflict of interest.

References

Akbar, K., Pamungkas, A. D. I., Studi, P., Olahraga, P., Keguruan, F., Ilmu, D. A. N., & Surakarta, U. M. (2021). Pengaruh Metode Latihan Drill Dan Strokes.

Anam, K., Irawan, F. A., & Nurrachmad, L. (2018). Pengaruh Metode Latihan dan Koordinasi Mata-Kaki terhadap Ketepatan Tendangan Jarak Jauh. 8.

Armour, K. (2013). Sport Pedagogy An introduction to teaching and coaching. In Sport Pedagogy. https://doi.org/10.4324/9781315847108

Badaru, B., Bismar, A. R., Kadir, M., & Tetap, T. (2024). Perbedaan pengaruh latihan target tetap dan target bergerak terhadap ketepatan pukulan gyaku tsuki pada atlet perguruan inkanas kabupaten bantaeng. 7, 2653–2661.

Bagaskara, E. (2017). The effects of smash training with a fixed target and a moving target on the improvement of the smash skills among badminton athletes in pb ac quality Yogyakarta. Ekp, 13(3), 1576–1580.

Edwards, W. (2012). Motor learning and control : from theory to practice. Content Technologies. https://cir.nii.ac.jp/crid/1130282270316717696.bib?lang=en

Fajar, Y. D. Al, Suratman, Nasution, M., & Karjadi, M. S. (2022). Pengaruh Latihan Plyometric Terhadap Power Tungkai Pemain Persatuan Bulutangkis Baleraya Balekambang Tahun 2022. Lembaran Ilmu Kependidikan, 51(2), 70–75.

Hasibuan, N., Dlis, F., & Pelana, R. (2020). The Effect of Drilling Exercise Using Level Net and Standard Net to Improve Forehand Overhead Lob Technique for Badminton Beginner Players. Proceedings of the International Conference on Educational Research and Innovation (ICERI 2019). https://doi.org/10.2991/assehr.k.200204.044

Hidayah, T., & Akhiruyanto, A. (2023). The effect of LTAD-based programming on fundamental skills and physical abilities of basketball players aged 11-12 years. 7989, 909–917. https://doi.org/10.17309/tmfv.2023.6.13

Hidayah, T., Akhiruyanto, A., Yudhistira, D., & Kurnianto, H. (2023). The Effects of LTAD-Based Programming on Fundamental Skills and Physical Abilities of Basketball Players Aged 11-12 Years. Physical Education Theory and Methodology, 23(6), 909–917. https://doi.org/10.17309/tmfv.2023.6.13

Intan Primayanti, I. (2019a). Pengaruh Latihan Drill Dan Latihan Pola Pukulan Terhadap Kemampuan Smash Bulutangkis Pada Pb Liansa Juniormasbagik. Program Studi Pendidikan Olahraga Dan Kesehatan, Fakultas Pendidikan Olahraga DanKesehatan, InstitutKeguruan Dan Ilmu Pendidikan IKIP Mataram, 6, 25–31.

Intan Primayanti, I. (2019b). Pengaruh Latihan Drill Dan Latihan Pola Pukulan Terhadap Kemampuan Smash Bulutangkis Pada Pb Liansa Juniormasbagik. Program Studi Pendidikan Olahraga Dan Kesehatan, Fakultas Pendidikan Olahraga DanKesehatan, InstitutKeguruan Dan Ilmu Pendidikan IKIP Mataram, 6, 25–31.

Ivantri, A. S. (2019). Pengaruh Latihan Service Sasaran Tetap dan Sasaran Berubah Terhadap Kemampuan Service Sepaktakraw. 331–344.

Kamali, S. (2018). Pengaruh Metode Drill Terhadap Hasil Belajar Smash Bulutangkis Di Sma Negeri 4 Singkawang. Jurnal MathEducation Nusantara, 1(1), 89–96. https://jurnal.pascaumnaw.ac.id/index.php/

Koike, S., & Hashiguchi, T. (2014). Dynamic Contribution Analysis of Badminton Smash-Motion with Consideration of Racket Shaft Deformation (A Model Consisted of Racket-side Upper Limb and a Racket). Procedia Engineering, 72, 496–501. https://doi.org/10.1016/j.proeng.2014.06.135

Lee, M. C. Y., Chow, J. Y., Komar, J., Tan, C. W. K., & Button, C. (2014). Nonlinear pedagogy: An effective approach to cater to individual differences in learning a sports skill. PLoS ONE, 9(8). https://doi.org/10.1371/journal.pone.0104744

Mardiana, F. (2019). Pengaruh Metode Latihan Sasaran Tetap, Sasaran Berubah, Dan Koordinasi Mata Tangan Terhadap Ketepatan Servis Float Pada Peserta Ekstrakurikuler Bola Voli. Doctoral Dissertation, Universitas Negeri Semarang, 13–18.

Mulyana, D. (2019). Perbandingan Pengaruh Latihan Knee Tuck Jump Dengan Barrier Hops Terhadap Peningkatan Power Otot Tungkai. Journal of SPORT (Sport, Physical Education, Organization, Recreation, and Training), 3(1), 22–28. https://doi.org/10.37058/sport.v3i1.754

Rustandi, E., & Safitri, S. (2019). Pengaruh metode drill terhadap hasil smash siswa ekstrakulikuler permainan bulutangkis smk negeri 1 lemahabang kecamatan lemahabang kabupaten cirebon. Journal respecs. JOURNAL RESPECS, 1(2), 68. https://doi.org/10.31949/jr.v1i2.1472

Subagja, R. (2023). Perbandingan pengaruh latihan drilling sasaran tetap dengan drilling sasaran berubah terhadap keterampilan spike bola voli (Eksperimen pada siswa putra ektrakulikuler bola voli SMK Singaparna Kabupaten Tasikmalaya Tahun Ajaran 2023/2024) [Universitas Siliwangi]. http://repositori.unsil.ac.id/id/eprint/10143

Sugiyono, D. (2010). Metode penelitian kuantitatif kualitatif dan R&D. In Penerbit Alfabeta.

Tudor Bompa, C. (2015). Conditioning Young Athletes. In Human Kinetics (Vol. 53, Issue 9).

Wahyuni, R., Prasetyo, Y., Nugroho, S., & Nasrulloh, A. (2023). The Effect of Drilling Training on Improving the Balance of Badminton Athletes. International journal of multidisciplinary research and analysis, 06(06). https://doi.org/10.47191/ijmra/v6-i6-42

Wati, S., Sugihartono, T., & Sugiyanto, S. (2018). Pengaruh latihan terpusat dan latihan acak terhadap hasil penguasaan teknik dasar bola basket. Kinestetik,2(1), 36–43. https://doi.org/10.33369/jk.v2i1.9185

Wiratama, S. A., & Karyono, T. (2017). Efek metode latihan drill terhadap ketepatan smash atlet bulu tangkis berusia muda di yogyakarta. Jorpres (Jurnal Olahraga Prestasi), 13(1), 60–67. https://doi.org/10.21831/jorpres.v13i1.12885

Yudhistira, D., Suherman, W. S., Wiratama, A., Wijaya, U. K., Paryadi, P., Faruk, M., Hadi, H., Siregar, S., Jufrianis, J., & Pratama, K. W. (2021). Content Validity of the HIIT Training Program in Special Preparations to Improve the Dominant Biomotor Components of Kumite Athletes. International Journal of Human Movement and Sports Sciences, 9(5), 1051–1057. https://doi.org/10.13189/saj.2021.090527

Yudhistira,D. (2018). Pengaruh Latihan Target Tetap Dan Bergerak Terhadap Ketepatan Pukulan Gyaku-Tsuki Pada Atlet Karate Amura Diy (Jurnal). In skripsi. Universitas Negeri Yogyakarta.

Authors' and translators' details:

Didik Cahyono	didikcahyono86@gmail.com	Autor/a
Muhammad Sukron Fauzi,	sukron.fauzi@fkip.unmul.ac.id	Autor/coresponding author
Gyta Krisdiana	gytacahyaningrum@fkip.unmul.ac.id	Autor/a
Naheria	naheria@fkip.unmul.ac.id	Autor/a
Hamdiana	hamdiana@fkip.unmul.ac.id	Autor/a
Julianur	jul196@umkt.ac.id	Autor/a
Muchamad Samsul Huda	mshudari@gmail.com	Autor/a
Muhamad Saiin	saiinmuhamad83@gmail.com	Autor/a
Jeane Betty Kurnia Jusuf	jbk567@umkt.ac.id	Autor/a
Dewangga Yudhistira	dewanggayudhistira@unesa.ac.id	Autor/a