

Improving drive strokes of beginner tennis players through hand-eye coordination-based training methods

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Received: 30 May 2024; Revised: 10 June 2024; Accepted: 17 August 2024; Available online: 31 August 2024.

Abstract

The mastery of skills by field tennis players is very important. To master the skills, novice players must practice a lot. In the training process, the right training method is needed so that beginner players can master mastery of field tennis skills such as drive strokes. This study aimed to determine the effectiveness of training methods with hand-eye coordination in improving field tennis drive skills. This study used an experimental method with a 2x3 factorial research design. This study used a purposive sampling technique, so the number of subjects obtained was 60. The research instrument used the Dyer tennis test to determine the skill of field tennis drive shots. Analysis of research data Data analysis in this study used a prerequisite test with Sig > $\alpha 0.05$ and hypothesis testing using the two-way ANOVA test. The results showed that the sig value was $0.004 < 0.05$, so there was a difference in the effect of training methods in improving field tennis drive shots. It can be concluded that the paired training method is better, with an average value of 45.6, compared to the training method of the ball bounce machine against the wall, and the training method with a thrower, with an average value of 41.3 and 38.7.

Keywords: Skills, Tennis, methods, drills.

How to Cite: Nur, M., Mappaompo, M. A., Juhanis, J., Awal, A., & Purwanto, D. (2024). Improving drive strokes of beginner tennis players through hand-eye coordination-based training methods. *Jurnal SPORTIF : Jurnal Penelitian Pembelajaran*, 10(2), 305-319.
https://doi.org/10.29407/js_unpgri.v10i2.23469

Authors contribution: a – Preparing concepts; b – Formulating methods; c – Conducting research; d – Processing results; e – Interpretation and conclusions; f - Editing the final version.

INTRODUCTION

Tennis training for university students frequently encounters obstacles that impede their skill development. According to the literature, sports training programs in higher education institutions frequently

encounter significant challenges due to inadequate facilities and resources. Research conducted by [Muneer and Sultana \(2018\)](#) demonstrated that inadequate sports facilities could improve, particularly in sports that necessitate specialized apparatus, such as tennis. In the same vein, [Athanasailidis \(2020\)](#) conducted a study that underscored the significance of the availability of competent instructors to guarantee that training programs are effective and adhere to established standards.

Trainers frequently encounter challenges associated with learners' skill-level disparities, particularly in higher education environments. [Lin et al. \(2021\)](#) contend that trainers must be capable of customizing their approach to accommodate the unique requirements of apprentices, who may possess a wide range of technical abilities and levels of experience. More experienced pupils may experience a lack of challenge, while novices may feel overwhelmed in the absence of a structured approach. In the context of sports instruction, motivation is an essential psychological factor. Through the lens of Self-Determination Theory, [Pratama \(2019\)](#) underscores the importance of intrinsic motivation in the pursuit of success in athletic endeavors. [Weiss \(2020\)](#) conducted a study that demonstrated that highly motivated university students exhibited a greater level of commitment to training and experienced a more substantial development in their skills than those who were lowly motivated. The significance of physical and mental preparedness in competitive sports was underscored by [Ji et al. \(2022\)](#). The optimal performance in tennis is contingent upon the mental preparedness to handle duress and the exceptional physical condition. According to a study by [Newman et al. \(2021\)](#), training that exclusively emphasizes technique without considering physical and mental conditioning can elevate the likelihood of injury and diminish the capacity to perform at a high level.

Sports training has become significantly influenced by contemporary technologies, including video analysis. Nevertheless, [research by Diciano et al. \(2021\)](#) indicates that the practical implementation of these technologies and the cost and the absence of coach training frequently

impede their adoption in higher education settings. In reality, this technology can considerably enhance the assessment of game strategies and techniques. The challenges associated with tennis training among university students demonstrate that the effectiveness of training programs is contingent upon a variety of factors, including the utilization of technology, motivation, time, and facilities, in addition to technical aspects (Budi et al., 2020; Suharjana, 2019). The significance of a holistic approach, which encompasses the integration of theory and practice and the consideration of students' physical and mental well-being, is also underscored in the existing literature. Trainers and policymakers will be able to develop more effective training programs tailored to students' requirements by comprehending these issues through a literature review.

There is an urgent need to master the drive technique in court tennis, particularly for university students who are learning and enhancing their abilities in this sport (Jatra et al., 2022). Tennis players are required to acquire the drive stroke, which is a fundamental skill that is essential in a variety of game situations. This includes the forehand and backhand. Several factors contribute to the significance of motor stroke for university students. The drive is a fundamental stroke in tennis and is frequently employed during rallies (Kovacs & Ellenbecker, 2011). Players can maintain the rally, control the game, and compel their opponent to move in a variety of directions by mastering this stroke. Mastering the shot stroke is a critical initial step in the development of a student's tennis technique. In tennis, the capacity to accurately position the ball in the desired location is essential for securing a point. The drive stroke enables the player to exert pressure on the opponent by consistently executing purposeful strokes, which can make it challenging for the opponent to return the ball effectively (Sitompul, 2020).

This stroke can be employed by students who are proficient in drive to establish the game's tempo, exploit the opponent's weaknesses, or prepare for a subsequent attack, such as a volley or smash (Mawarda & Nurhidayat, 2021). Players can employ a wider range of more effective

strategies by mastering the drive. A strong drive instills in players the assurance that they can manage the object and the game as a whole. This confidence is particularly crucial in match situations, particularly when contending with more formidable opponents or under high-pressure circumstances.

Students who are proficient in the drive will find it simpler to learn and conquer other shots, including the lob, slice, or topspin. Additionally, a strong drive facilitates the transition to more intricate techniques, such as drop shots or passing shots. A drive shot executed with the appropriate technique necessitates reduced joint tension, particularly the wrist, elbow, and shoulder, and optimal body coordination (Mu'ammara, 2017). Students must be able to play tennis for an extended period of time without encountering any significant physical complications.

Students who demonstrate proficiency in this technique demonstrate an understanding and ability to implement the fundamental principles of tennis. Furthermore, instructors can employ drive mastery to assess skill development and offer more precise and targeted feedback. University students' drive mastery encompasses fundamental tennis skills and the establishment of a robust foundation for advancing advanced techniques, enhancing game control, and promoting confidence on the court. Ultimately, students' match performance will be enhanced by developing more mature tactical and strategic abilities, which can be achieved through adept drive mastery. This urgency underscores the significance of focused and sustained training in developing the drive technique as a component of the tennis training curriculum in higher education settings. This research in the future can provide benefits, especially in improving tennis skills, especially in the drive stroke technique, according to the results of the study, Wang & Li (2023) stated that the need to improve skills by using the Exercise method approach. This study provides 3 alternative training methods so that it can determine the effectiveness of the training method as an improvement in drive stroke skills.

METHODS

Research Design

This research uses an experimental method with a 2x3 factorial research design. Factorial designs expand the number of relationships with experimental research approaches. They are a modification of the posttest-only control group or pretest-posttest control group design. Variations of this design use two or more different treatment groups and no control group (Creswell, 2013). In addition to using a factorial design, this study also used a single-subject design. Single-subject research involves extensive data collection on one subject at a time.

The subjects involved in this study were beginner tennis players with less tennis experience and an age range from 18 to 25 years. The determination of the sample is based on data taken at each meeting, where the subject takes one test at the beginning of the meeting, the treatment is given to the subject for 16 meetings, in this study using a purposive sampling technique with consideration of age and level of skill in playing field tennis, so that the number of subjects obtained is 60 people, then the data is used as a sample in this study.

Table 1. Research design

Group (Exercise Method (A) and Eye-hand coordination)	The Wall Exercise (A1)	Throwing Machine (A2)	Paired Exercise (A3)
Coordination High (B1)	A1B1	A2B1	A3B1
Coordination Low (B2)	A1B2	A2B2	A3B2
Total	A1	A2	A3

This 2x3 factorial design will divide the sample into four groups consisting of a group that has a high level of hand-eye coordination given the treatment of the Wall Ball Bounce Exercise method (A1B1), a group that has a low level of hand-eye coordination given the treatment of the Wall Ball Bounce Exercise method (A1B2), the group that has a high level of coordination is given the treatment of the Throwing Machine Exercise method (A2B1) and the group that has a low level of coordination is given the treatment of the Throwing Machine Exercise method (A2B2), the group

that has a high level of coordination is given the treatment of the Paired Exercise method (A3B1) and the group that has a low level of coordination is given the treatment of the Paired Exercise method (A3B2).

Research Procedure

Before conducting treatment on the subject, the researcher conducted an eye and hand coordination test first on the subject. Furthermore, before entering the treatment stage, the subjects were divided into 6 groups, each of 10 people. The group that has a high level of hand-eye coordination is given the treatment of the Wall Ball Bounce Training method (A1B1) 10 people, the group that has a low level of hand-eye coordination is given the treatment of the Wall Ball Bounce Training method (A1B2) 10 people, the group that has a high level of coordination is given the treatment of the Throwing Machine Training method (A2B1) 10 people, The group that has a low coordination level is given the treatment of the Throwing Machine Exercise method (A2B2) 10 people, the group that has a high coordination level is given the treatment of the Paired Exercise method (A3B1) 10 people, and the group that has a low coordination level is given the treatment of the Paired Exercise method (A3B2) 10 people. The implementation of giving treatment to the subjects lasted for 16 meetings, three times a week, assuming that the number of exercises 16 times was able to improve the skills of the punch technique.

Research Instruments

This study can determine the development of the skills of the drive stroke in beginner tennis players using the Dyer tennis test to determine the skill of field tennis drive strokes. This test is often used to test drive stroke skills in tennis. This study also used a coordination test as one of the techniques for dividing groups so that the eye-hand coordination test could be carried out as a test to see the development of coordination for research subjects. This coordination test was used only at the beginning as a sample divider into groups by dividing high and low coordination.

Data Analysis

Data analysis in this study uses normality test analysis to test whether the data is normal or not with the assumption that $\text{Sig} > \alpha 0.05$ the data is normally distributed. The homogeneity test determines whether the data tested is homogeneously distributed with the assumption that $\text{Sig} > \alpha 0.05$ the data is homogeneously distributed, after conducting the prerequisite test, the hypothesis test is then carried out using the two-way ANOVA test. This data analysis uses a statistical approach using the SPSS v.25 application.

RESULT

The description of the results of data analysis carried out with a statistical approach shows data on the training method of bouncing the ball against the wall, the ejection machine training method, the paired training method on improving the tennis court drive is explained in the table below.

Table 2. Data description of the training method results in high and low coordination groups.

Group	Coordination Group	Statistics	Pretest Results	Posttest Results
Training method of bouncing the ball against the wall	High	Average	48.2	53.9
		SD	824.120	832.041
Training method of bouncing the ball against the wall	Low	Average	46.3	46.1
		SD	762.421	786.642
Practice the method of ejection machine	High	Average	48.6	54.2
		SD	773.826	776.172
Practice the method of ejection machine	Low	Average	32.4	32.2
		SD	66.291	674.131
Paired training method	High	Average	41.1	47.1
		SD	627.721	711.612
Paired training method	Low	Average	47,8	47.9
		SD	732.242	745.377

Based on Table 2, it can be seen that the combination of training methods The training method of bouncing the ball against the wall with high hand-eye coordination has an average value of initial test results of 48.2 and final test results of 53.9 with a difference of 5.7. Likewise, the combination of training methods The wall ball bounce training method with

low eye-hand coordination has an average value of initial test results of 46.3 and final test results of 46.1 with a difference of 0.2.

The combination of training methods, the throwing machine training method with high eye-hand coordination, has an average initial test result value of 48.6 and an average final test value of 54.2 with a difference of 5.6. The combination of the training method of the throwing machine training method with low eye-hand coordination has an average initial test result value of 32.4 and an average final test value of 32.2 with a difference of 0.2.

The combination of training methods, the paired training method with high hand-eye coordination, has an average initial test score of 41.1 and an average final test score of 47.1 with a difference of 6.0. The combination of training methods, the paired training method with low eye-hand coordination, has an average initial test result value of 47.8 and an average final test value of 47.9 with a difference of 0.1. What can be concluded from each combination of training methods with eye-hand coordination is that there is an increase in the average value of the tennis court drive test results.

Hypothesis Test

After the prerequisite test is carried out, hypothesis testing is carried out using parametric statistics because the data comes from a normal and homogeneous distribution. The parametric test in this study is the two-way ANOVA test, which will be presented in the table above.

Effect of training method with tennis court drive strokes

It shows that the sig value is $0.004 < 0.05$, so there is a difference in the effect of training methods in improving field tennis drive strokes. It can be concluded that the paired training method is better, with an average value of 45.6, compared to the training method of the ball bounce machine against the wall, and the training method with a thrower, with an average value of 41.3 and 38.7.

Interaction of training method and coordination level

Furthermore, the data processing results show Sig 0.003 <0.05, so there is an interaction between the training method and the level of coordination in improving field tennis drive shots. So, there is a unique combination effect between the training media and the level of coordination of novice tennis players,

Effectiveness of training methods and results of high coordination tennis court drives

Based on the results of the research data, the Sig value is 0.002 <0.05, so there are differences in the effect of the ball bounce training method on the wall, the ejection machine training method, and the paired training method on the tennis court drive in the high coordination group. Thus, the paired training method is more effectively used in the high coordination group, with a group average value of 47.4 compared to the ejection machine training method, and the paired training method, which has an average value of 42.6 and 39.8 to improve the tennis court drive stroke.

Effectiveness of training methods and results of low coordination tennis court drives.

The results of the analysis of the low coordination group showed a Sig value of 0.271 > 0.05, so there was no effect of the wall ball bounce training method, the ejection machine training method, and the paired training method on the field tennis drive in the low coordination group. Thus, there is no difference or equal influence between the training method of bouncing the ball on the wall, the training method of the ejection machine, and the paired training method on the tennis court drive in the low coordination group. Furthermore, judging from the average value of the paired training method group, the average value of 47.9 is greater than the group of the wall ball bounce training method and the ejection machine training method, which have an average value of 46.1 and 32.2. So, using paired training methods is more effective than the wall ball bounce and the ejection machine training methods in the low coordination group in improving field tennis drive shots.

DISCUSSION

Thus, the paired training method proved to be more effective in improving tennis drive shots in the low-coordination group compared to the bouncing ball on the wall and ejection machine training methods. This is indicated by the mean value of the paired training method (47.9), which is higher than that of the bouncing ball on the wall method (46.1) and the ejection machine method (32.2). The drive stroke is a foundational tennis stroke that is essential for novice players to acquire. These movements are typically executed with the forehand or backhand during rallies, depending on the direction of the ball's travel. The objective of the drive stroke is to generate a low, fast, and hardball, thereby presenting a challenge for the opposing team to return it effectively. The ball is accelerated by the force with which it is struck when a drive stroke is executed. It is imperative to sustain this tempo to exert pressure on the opposition. The stroke method with the least amount of friction power is the drive stroke, which is conducted with the racket closed and the racket movement pushed upward from the bottom. The drive is essential for developing other abilities, particularly for drive shots, in the case of novice tennis players (Prasetiono & Gandasari, 2018; Siagian et al., 2021). Tennis players frequently employ drive shots to score points, as they necessitate a high level of technical proficiency to execute an effective attack. The thrust strategy is the most frequently employed approach for engaging opponents who are currently playing (Kamalussadad et al., 2022; Manurung et al., 2022). According to Silva et al. (2022), there is a belief that the forehand punch technique is the most dominant and has the most energy when smashing.

Additionally, the forehand punch uses more energy than the backhand punch. A forehand drive is defined as a stroke delivered with the palm of the hand holding the bet or jacket facing forward when striking the ball, according to Kim & Xie (2021). An analysis of movement techniques is necessary to determine the true range of motion in table tennis skills

Beginners of tennis skills require special attention in the selection of appropriate training methods because the methods used greatly affect the development of basic techniques and understanding of the game (Raibowo et al., 2022). One of the main problems is the selection of appropriate training methods for beginners' skill levels. Some methods may be too complex or inappropriate for beginners, which can lead to confusion or frustration. For example, practice methods that focus too much on advanced techniques, such as spin or complex serves, can confuse beginner players who have not mastered the basics such as grip, stance, and basic strokes. Monotonous or uninteresting practice methods can make beginners feel bored and lose interest in learning. Drills should be designed to be fun and challenging, with enough variety to keep the player's interest high.

Problems with tennis skills for beginners are often related to the selection and application of training methods that are not suitable for their needs. Training methods should be structured to ensure optimal development, emphasize basic techniques, pay attention to coordination and footwork, provide constructive feedback, and maintain motivation with varied and interesting exercises (Budi et al., 2020). With the right approach, beginners can develop strong basic skills and be ready to learn more complex techniques later on.

The training approach has an impact on developing drive shot abilities in terms of rookie tennis players' coordination, according to the results of the importance of the research findings designed with an emphasis on enhancing the skill of field tennis drive strokes. The ejection machine training method, the partnered tennis drive training method, and the ball-bouncing against-the-wall training method will be provided. There were a number of difficulties or barriers in the way of this investigation therefore it could have progressed better. Using training methods to enhance athletic abilities (Aksir et al., 2023; Siagian et al., 2021). A few more variables that may influence the effectiveness of skill acquisition include player circumstances, psychological variables, infrastructure, and

training methodologies (Siagian et al., 2021; Veykut, 2017). Using the ball bounce training method to the wall, the ejection machine training method, and the paired training method, field tennis drive skills have improved (Manurung et al., 2022; Wang & Li, 2023). Students' efforts indicate that this training method is one of the answers and is simple to follow, helping to enhance table tennis drive skills.

The results of this study are inseparable from the limitations that can occur, including the level of an insufficient number of research samples involved, with 60 tennis players divided into various groups based on the level of coordination, making the sample less focused on this study, the characteristics of the research subjects require research only focused on the region so that the skill level is not much different. In the future, from the findings of this study, novice tennis players and coaches can improve their skills so that the technique of field tennis skills will increase, for other studies, further research can provide training methods that emphasize mastery of other skills in field tennis.

CONCLUSIONS

The research findings found that the combination of training methods with eye-hand coordination increases the average value of the tennis court drive test results. This further emphasizes that the training method is a form of stimulus that can improve skills in sports. The results of these findings in the future can provide an opportunity to improve training methods for basic technical skills, especially in field tennis. From the findings of this study, beginner tennis players and coaches can improve their skills so that the technique of field tennis skills increases; for other studies, further research can provide training methods that emphasize mastery of other skills in field tennis.

REFERENCES

- Aksir, I., Suherman, W. S., Alim, A., Hasmyati, H., & Mappanyukki, A. A. (2023). Development of tennis skills training based on trainer model for beginner athletes. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, 9(3). https://doi.org/10.29407/js_unpgri.v9i3.21634

- Athanailidis, I. (2020). Finding tennis talents in Greece. *Journal of Human Sport and Exercise*, 15(Proc4), 1030–1034. <https://doi.org/10.14198/jhse.2020.15.Proc4.05>
- Budi, D. R., Syafei, M., Kusuma, M. N. H., Suhartoyo, T., Hidayat, R., & Listiandi, A. D. (2020). The significance of exercise method on forehand and backhand groundstroke skills improvement in tennis. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, 6(1). https://doi.org/10.29407/js_unpgri.v6i1.13920
- Candra, J., Pasaribu, A., & Fauzan, A. (2019). Pembuatan Mesin Pelontar Bola (Penbal) Alat Bantu Pembelajaran Dan Latihan Olahraga Bolavoli. *Jurnal Prestasi*, 3, 73. <https://doi.org/10.24114/jp.v3i6.15899>
- Creswell, J. W. (2013). Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. In *Journal of Chemical Information and Modeling*. <https://doi.org/10.1017/CBO9781107415324.004>
- Deng, N., Soh, K. G., Abdullah, B., Huang, D., Sun, H., & Xiao, W. (2023). Effects of physical training programs on female tennis players' performance: a systematic review and meta-analysis. In *Frontiers in Physiology* (Vol. 14). <https://doi.org/10.3389/fphys.2023.1234114>
- Diciano, J., Mateo, W., Junior, R. J., Verzosa, J. I., & Tindowen, D. J. (2021). Students' experiences in learning physical education in an online environment. *Edu Sportivo: Indonesian Journal of Physical Education*, 2(3), 140. [https://doi.org/10.25299/es:ijope.2021.vol2\(3\).7792](https://doi.org/10.25299/es:ijope.2021.vol2(3).7792)
- Hazrina, A., Yati, R., & Kuston, S. (2017). Pengembangan Teknologi Pelontar Bola. *Jurnal Terapan Ilmu Keolahragaan 2017 Vol.02 No.02 Halaman 18-24 EISSN:*, 02(02), 18–24.
- Jatra, R., Dafit, F., Wijaya, C., & Yeni. (2022). Pengenalan Olahraga Tenis Lapangan Pada Anak Sekolah Dasar. *Community Education Engagement Journal*, 4(1), 11–19. <https://doi.org/10.25299/ceej.v4i1.10537>
- Ji, C., Yang, J., Lin, L., & Chen, S. (2022). Anxiety and Sleep Quality Amelioration in College Students: A Comparative Study between Team Sports and Individual Sports. *Behavioral Sciences*, 12(5). <https://doi.org/10.3390/bs12050149>
- Kamalussadad, A. F., Pramono, H., & Hanani, E. S. (2022). The Effect of Training Methods and Hand Eye Coordination on the Accuracy of Backhand Drive in Table Tennis Athletes. *JUARA: Jurnal Olahraga*, 7(3). <https://doi.org/10.33222/juara.v7i3.2458>
- Kim, J., & Xie, X. (2021). Teaching Tennis Footwork Techniques in School Physical Education. *Journal of Physical Education, Recreation and Dance*, 92(7). <https://doi.org/10.1080/07303084.2021.1948465>
- Kovacs, M. S., & Ellenbecker, T. S. (2011). A Performance Evaluation of

- the Tennis Serve: Implications for Strength, Speed, Power, and Flexibility Training. *Strength & Conditioning Journal*, 33(4). https://journals.lww.com/nsca-scj/fulltext/2011/08000/a_performance_evaluation_of_the_tennis_serve_5.aspx
- Lin, Y., Wang, J., Su, Y., & Wang, I.-L. (2021). Exploring the Gaze Behavior of Tennis Players with Different Skill Levels When Receiving Serves through Eye Movement Information. *Applied Sciences*, 11(19), 8794. <https://doi.org/10.3390/app11198794>
- Manurung, H. V., Nasuka, N., & Hidayah, T. (2022). Training Methods and Speed on Agility in the Tennis Community Ages 21-24. *JUARA: Jurnal Olahraga*, 7(2). <https://doi.org/10.33222/juara.v7i2.2013>
- Mawarda, H. D., & Nurhidayat. (2021). Keterampilan Servis Flat Tennis Lapangan. *Jurnal Porkes: Pendidikan Jasmani Kesehatan & Rekreasi*, 4(2), 110–117. <https://doi.org/10.29408/porkes.v4i2.4651>
- Moya-Ramon, M., Nakamura, F. Y., Teixeira, A. S., Granacher, U., Santos-Rosa, F. J., Sanz-Rivas, D., & Fernandez-Fernandez, J. (2020). Effects of Resisted vs. Conventional Sprint Training on Physical Fitness in Young Elite Tennis Players. *Journal of Human Kinetics*, 73(1). <https://doi.org/10.2478/hukin-2019-0142>
- Mu'ammad, M. (2017). Pengaruh metode latihan drill dan koordinasi terhadap ketepatan servis tenis meja. *Jurnal Keolahragaan*, 5(1). <https://doi.org/10.21831/jk.v5i1.12805>
- Muneer, P., & Sultana, D. (2018). European Journal of Physical Education and Sport Science Physical Activity And Gross Motor Proficiency Of Children With Autism Spectrum Disorder: A Systematic Review. *European Journal of Physical Education and Sport Science*, 5(1), 100–114. <https://doi.org/10.5281/zenodo.1524467>
- Newman, T. J., Lower-Hoppe, L., Anderson-Butcher, D., & Paluta, L. M. (2021). Process evaluation examining the implementation of a sport-based positive youth development program. *Journal of Youth Development*, 15(6). <https://doi.org/10.5195/JYD.2020.890>
- Prasetiono, B. A., & Gandasari, M. F. (2018). Model Rangkaian Tes Keterampilan Tennis Lapangan pada Pemain Putra Kelompok Usia 12-14 Tahun. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, 4(2). https://doi.org/10.29407/js_unpgri.v4i2.12498
- Pratama, R. R. (2019). Pengaruh Gizi, Motivasi dan Percaya Diri Terhadap Prestasi Atlet Sepakbola Universitas Sriwijaya. *Journal Of Sport Education (JOPE)*, 1(2), 37. <https://doi.org/10.31258/jope.1.2.37-42>
- Raibowo, S., Fathoni, A. F., & Adi, S. (2022). Audio-visual teaching materials supporting tennis. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, 8(2). https://doi.org/10.29407/js_unpgri.v8i2.17748

- Ren, Y. (2018). The Application of Tennis Wall in Tennis Training and Analysis of Innovative Training Methods. *Advances in Social Science, Education and Humanities Research*, 250(Emim), pp. 372–375. <https://doi.org/10.2991/emim-18.2018.75>
- Siagian, S., Mahmuddin, M., & Hasibuan, R. (2021). Pengaruh Latihan Medicine Ball Twist Toss Dan Forearm Pronation Exercise Terhadap Kemampuan Forehand Drive Tennis. *Jurnal Prestasi*, 5(1). <https://doi.org/10.24114/jp.v5i1.25601>
- Silva, R. M. F., Mendonça, C. R., Azevedo, V. D., Memon, A. R., Silva Noll, P. R. E., & Noll, M. (2022). Barriers to high school and university students' physical activity: A systematic review. *PLoS ONE*, 17(4 April), 1–24. <https://doi.org/10.1371/journal.pone.0265913>
- Sitompul, S. R. (2020). Development of tennis serve learning models based on multiple training. *International Journal of Human Movement and Sports Sciences*, 8(6). <https://doi.org/10.13189/saj.2020.080702>
- Suharjana, P. S. (2019). Improving gross motor skills by kinaestheticandcontemporary-based physical activity in early childhood. *Cakrawala Pendidikan*, 38(3). <https://doi.org/10.21831/cp.v38i3.25324>
- Tsetseli, M., Malliou, V., Zetou, E., Michalopoulou, M., & Kambas, A. (2010). The effect of a coordination training program on the development of tennis service technique. *Journal Biology of Exercise*, 6(1), 29–36. <https://doi.org/10.4127/jbe.2010.0033>
- Veykut, A. G. (2017). On the proprietary method of breathing exercises applied in training of professional tennis players. *Human Sport Medicine*, 17(3). <https://doi.org/10.14529/hsm170307>
- Wang, J., & Li, Y. (2023). Strength Training Method For Tennis Players. *Revista Brasileira de Medicina Do Esporte*, 29. https://doi.org/10.1590/1517-8692202329012022_0632
- Weiss, M. R. (2020). Motor skill development and youth physical activity: A social psychological perspective. In *Journal of Motor Learning and Development* (Vol. 8, Issue 2). <https://doi.org/10.1123/JMLD.2020-0009>
- Yasriuddin, Y., & Hudain, M. A. (2020). Application of Teaching Methods (Ball Reflection to the Wall, Throwing Machine, in-pairs) and Eye Coordination to Increase the Drive Beating Skills on Tennis. *Journal of Educational Science and Technology (EST)*, 6(2), 117–125. <https://doi.org/10.26858/est.v6i2.12585>
- Zhang, J. (2022). Training Methods For Athletes' Neurological Reaction Times. *Revista Brasileira de Medicina Do Esporte*, 28(2). https://doi.org/10.1590/1517-8692202228022021_0454