

THE EFFECT OF TGfU LEARNING MODEL ON LEARNING OUTCOMES OF BADMINTON SMASH AND DROPSTROKE STROKES IN JUNIOR HIGH SCHOOL

Amat Komari

Faculty of Sport and Health Sciences, Universitas Negeri Yogyakarta, , Jl. Colombo No. 1, Karangmalang, Depok, Sleman, Yogyakarta Special Region, Indonesia.

amatkomari@uny.ac.id

Abstract

This study aims to determine the effect of the teaching game learning model on the learning outcomes of smash and drop-shot badminton in junior high school. This research uses an experimental method with the 'One group pre-test post-test design' design. The population in this study consisted of seventh-grade students of SMP N 2 Gamping in the 2023/2024 school year, consisting of 1 class. Sampling in this study was carried out using a cluster sampling technique, which resulted in a sample size of 32 students. The instruments used in this study were smash accuracy tests and drop shot accuracy tests from Poole (2008: 33), with a validity of 0.77 and reliability of 0.86. Data analysis using a t-test with a significance level of 5%. The results showed (1) a significant effect of the TGfU learning model on junior high school smash learning outcomes. With a significance value (sig) of $0.000 < 0.05$. (2) There is a significant effect of the TGfU learning model on learning outcomes of junior high school drop shot, with a significance value (sig) of $0.000 < 0.05$

Keywords: TGfU learning model, Badminton, Smash stroke, Dropshot stroke

INTRODUCTION

Physical education and sports play a crucial role in the holistic development of learners in the school environment. Through these activities, students are not only introduced to the basic concepts of physical fitness but also taught the values of cooperation, healthy competition and self-discipline. In the face of changing times and technology, learning methods in this field must also continue to evolve to provide a more effective and enjoyable learning experience. One approach that has gained widespread attention in recent decades is the Teaching Games for Understanding (TGfU) model.

TGfU, first introduced by David Bunker and Rod Thorpe in the early 1980s, emerged as a response to traditional teaching methods that often focused too much on technical skills without regard to broader tactical and strategic understanding (Cocca et al., 2020). The model offers a new perspective in physical education to make learning more meaningful and contextualized for learners. TGfU emphasizes understanding the game through authentic play activities, allowing students to develop technical skills in a context relevant to actual game situations.

In the context of sports learning at the junior high school (SMP) level, especially in badminton, implementing TGfU becomes very relevant. Badminton, as one of the most popular sports in the world, especially in Asian countries such as Indonesia (Puja et al., 2021), requires a learning approach that can accommodate the complexity of the techniques and tactics of the game. Two essential basic techniques in badminton are the smash and drop shot, each of which has different characteristics and functions in the game.

The smash shot, a rugged and steep downward shot towards the opponent's field, is often considered the primary weapon in scoring points. This shot requires high strength, speed, and accuracy. On the other hand, a drop shot is a smooth shot aimed at the front of the opponent's court to force the opponent to move forward from their position and create an opening for the next attack. These two shots have different strategic roles in the game, and mastery of both is essential for badminton players at all levels.

However, school reality shows that many teachers need to pay more attention to the students to perform directed smash and drop-shot shots. Performing these shots accurately and effectively improves badminton playing skills (Husaini et al., 2022; Ishak et al., 2022; Rahmat, 2021). This suggests a gap between the need to develop these complex skills and the teaching methods often used in schools.

This is where the role of TGfU becomes crucial (Aryanti et al., 2022; Ihsan et al., 2024; Ihsan et al., 2024). This learning model focuses on developing technical skills and emphasizes tactical understanding and decision-making in the game context. Through TGfU, students are expected to understand when and why they should use a smash or drop shot, in addition to how to do it technically (Arias et al., 2020; Cocca et al., 2020; García-Castejón et al., 2021; Li & Chano, 2024; Pan et al., 2023). This approach is in line with the findings of previous studies, which show that game-based learning can increase students' motivation, engagement and understanding of the sport being studied (Degens et al., 2019; Estero et al., 2020; Mousavi Sarvarzi et al., 2020).

Several previous studies have demonstrated the effectiveness of TGfU in learning various sports. For example, research by (Bathe et al., 2023 Syamsuar & Zen, 2021 Yuvaraj Ramasamy Juliana Usman & King, 2021) showed that a learning approach that integrates cognitive and motor aspects can improve students' understanding of sports concepts. In addition, (Pan et al., 2023) found that students who engaged in games designed to develop specific skills showed more significant improvement than those who only received technical instruction without a game context.

In the badminton context, research by (Ihsan et al., 2023; Ihsan et al. et al. 2023; Pan et al., 2023) showed that the use of learning methods that emphasize conceptual understanding and practical application could produce more comprehensive learning outcomes. They found that students who learn through an approach that combines theory and practice have a better experience and can apply their knowledge in relevant contexts.

However, the implementation of TGfU also has its challenges. One of the main challenges is the need for a deep understanding of the model on the part of teachers (Ihsan & Nasrulloh, 2023; Nathan, 2016). With proper knowledge and the ability to design appropriate games, TGfU can be practical and straightforward for students. Furthermore, the focus on tactical understanding may come at the expense of providing detailed technical feedback, which is essential in developing skills such as smash and drop shots.

However, the challenges outweigh the potential benefits of implementing TGfU in badminton learning, particularly for smash and drop-shot techniques. TGfU offers a more holistic and contextualized approach, which can help students develop technical skills, tactical understanding, and decision-making abilities. This is particularly important in sports such as badminton, where quick decisions and situational awareness are indispensable.

Based on this background, this study aims to determine the effect of the TGfU learning model on learning outcomes of badminton smash and drop-shot shots at the junior high school level. Specifically, this study will test two main hypotheses:

1. The TGfU Learning model significantly affects the learning outcomes of smash shots at the junior high school level.
2. The TGfU Learning model significantly affects the learning outcomes of junior high school drop shots.

The research will use an experimental design, "One group pre-test post-test design", to achieve these objectives. The population in this study were VII grade students of SMP N 2 Gamping in the 2023/2024 school year, with a sample of 32 students taken using a cluster sampling technique. The instruments used were the smash accuracy test and drop shot accuracy test from Poole (2008), which has a validity of 0.77 and reliability of 0.86.

This research design and instruments were selected based on the need to accurately measure changes in students' skills before and after implementing the TGfU learning model. The smash and drop shot accuracy tests were chosen because these two techniques are critical components in badminton play and are often decisive in point scoring.

This research is expected to contribute significantly to developing badminton learning methods at the junior high school level. If the research hypotheses are proven, these results will provide empirical support for the broader implementation of the TGfU model in the physical education curriculum, particularly for badminton learning. This may improve the quality of learning and student learning outcomes in this sport.

Furthermore, this study is also expected to provide new insights into how game-based approaches such as TGfU can effectively teach specific techniques such as smash and drop shots. This is important given that these two techniques have different characteristics - smash, which requires power and speed, and drop shot, which requires control and precision. Understanding how TGfU can accommodate the teaching of these two techniques simultaneously can provide valuable guidance for educators in designing more effective curricula and lesson plans (Aryanti et al., 2022; Estero et al., 2020; Li & Chano, 2024).

In addition, this study contributes to a broader discussion on the role of play-based approaches in physical education. With a focus on badminton, which is a popular sport in Indonesia and many other Asian countries (Ishak et al., 2022; Puja et al., 2021), this study can provide a valuable perspective on how TGfU principles can be applied to specific cultural and sporting contexts.

In a broader context, this study aligns with global trends in physical education that increasingly emphasize student-centred and understanding-based learning approaches. By investigating the effectiveness of TGfU in badminton learning, this study can contribute to the existing body of knowledge on pedagogical approaches in physical education and sports.

The structure of this article will begin with a comprehensive literature review on the TGfU learning model, basic badminton techniques (specifically smash and drop shots), and relevant previous studies. Next, the research methodology will be explained in detail, including the research design, population and sample, data collection instruments, and data analysis methods. The study's results will be presented and discussed in depth, focusing on the implications of the findings for badminton learning practices at the junior high school level. Finally, the conclusion will highlight the study's main findings and provide recommendations for further research as well as practical implementation in the context of physical education in schools.

Through this study, a deeper understanding of the effectiveness of the TGfU learning model in improving learning outcomes of badminton smash and drop-shot shots at the junior high school level can be obtained. The results of this study will be helpful for educators and policymakers in designing a more effective physical education curriculum. However, they can also contribute to developing theory and practice in sports education in general.

MATERIALS AND METHODS

This type of research is experimental. The experimental method is defined as a systematic method to establish relationships that contain causal-effect relationships (Husaini et al., 2022). The design used in this study is the "One Group Pretest-Posttest Design", which is a research design that has a pretest before being treated and a posttest after being treated. Thus, it can be

known more accurately because it can be compared to being held before being treated (Sugiyono, 2007). The design can be described as follows:



Description:

<i>Pre-test</i>	:	Initial test of smash and dropshot accuracy
<i>Group</i>	:	TGfU model treatment
<i>Post-test</i>	:	Final test of smash and dropshot accuracy

Data Analysis Technique

1. Prerequisite test of analysis

a. Data normality test

The Shapiro-Wilk Test, a key tool in data analysis, is used to verify the normality of the data distribution to be analysed. This test is conducted based on the specific variables being processed and is facilitated by SPSS 16.

b. Data homogeneity test

In addition to testing the distribution of values to be analysed, it is necessary to test homogeneity to ensure that the groups that make up the sample come from a homogeneous population. Homogeneity is sought with the F test of pretest and posttest data using the help of the SPSS 16 programme.

2. Hypothesis testing

Hypothesis testing uses the dependent sample T-test analysis method using the Paired Sample T-test, which is carried out to determine whether or not there is a difference in the average significance value and the essential criteria for deciding whether or not to test a hypothesis (Rahmat, 2021). By using criteria including:

- If the sig value (2-tailed) < 0.05 , then there is a significant difference between the initial and final results. This significantly affects the difference in treatment given to each variable
- If the sig value (2-tailed) > 0.05 , there is no significant difference between the initial and final results. This indicates no significant effect on the difference in treatment given to each variable.

DISCUSSION

Results

The research was conducted using an experimental method which aims to determine whether there is an effect of the TGfU learning model on the learning outcomes of smash and dropshot shots at the junior high school level. To determine the effect of the TGfU learning model, a total of 32 students from grade 7 were involved. This sample size was chosen to ensure a balance between statistical significance and practicality. The students were selected from diverse backgrounds to ensure the findings were representative of the junior high school population. Smash and dropshot are used as a pre-test or initial test and the sample gets treatment or treatment 12 times in the form of learning using the TGfU model and the final stage of the sample will re-conduct the final test or post-test which uses the same test used during the pre-test. The results of the acquisition of pre-test and post-test data can be described using descriptive statistical analysis as follows:

Table 1. Descriptive Statistics Data

Descriptive Statistics					
	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>
Pre Test Smash	32	12.00	25.00	19.6250	.62661
Post Test Smash	32	16.00	28.00	22.4375	.58705
Pre Test Dropshot		13.00	21.00	17.3125	.35763
Post test Dropshot		17.00	24.00	20.3438	.30655
Valid N (listwise)	32				

Based on the table above, the pre-test smash data results were obtained with a sample size 32. Minimum value = 12.00, maximum value = 25.00, average value (Mean) = 19.6250 and standard deviation (Std. deviation) = 0.63. The results of smash post-test data with a sample size of 32. Minimum value = 16.00, maximum value = 28.00, average value (Mean) = 22.4375 and standard deviation (Std. deviation) = 0.59. The results of the drop shot pre-test data with a sample size of 32. Minimum value = 13.00, maximum value = 21.00, mean value (Mean) = 17.3125 and standard deviation (Std. deviation) = 0.36. Minimum value = 17.00, maximum value = 24.00, mean value (Mean) = 20.3434 and standard deviation (Std. deviation) = 0.31.

1. Analysis Prerequisite Test

a. Data Normality Test

The normality test ensures that the data obtained is symmetrically or typically distributed. The normality test uses Shapiro-Wilk because the sample in this study is less than 50. With data processing using the help of the SPSS 26 computer program.

The results of the normality test can be seen in the data presentation in Table 3 below:

Table 2. Data Normality Test Results

Group	<i>p</i>	Sig.	Description
Smash Accuracy Pretest	0,310	0,05	Normal
Posttest of Smash Accuracy	0,192	0,05	Normal
Dropshot Accuracy Pretest	0,230	0,05	Normal
Posttest of Dropshot Accuracy	0,224	0,05	Normal

Based on the results of Table 2, it can be seen that all data have a p (sig) value > 0.05, so it can be concluded that all data are typically distributed. So, from the results of these data, all data declared typically distributed can be continued using parametric statistics. The homogeneity test can also be seen from the data distribution (dots) on the diagonal axis of the residuals in the histogram graph. If the data (dots) spreads around the diagonal line or follows the direction of the diagonal line, the data can be declared homogeneous. The distribution of data in the homogenates test can be seen in Table 3 below.

b. Data Homogeneity Test

The homogeneity test aims to ensure that the variants of each group are the same or similar so that comparisons can be made relatively. The homogeneity test rule is if $p > 0.05$. Then, the data is declared homogeneous; likewise, if $p < 0.05$, then the data is declared inhomogeneous. The results of the homogeneity test in this study can be seen in Table 3 below.

Table 3. Data Homogeneity test results

Levena Statistic	df ₁	df ₂	Sig.	Status
------------------	-----------------	-----------------	------	--------

Smash	0,111	1	62	0,740	Homogen
Dropshot	0,912	1	62	0,343	Homogen

Based on the results obtained in the table above, the acquisition of a significance value (sig) or probability value (p) is more significant than 0.05 ($p > 0.05$). It can be concluded that the data has a uniform variance in this study, or it can be stated that the data is homogeneous.

2. Hypothesis Test

- a. The Effect of TGfU Learning Model on Learning Outcomes of Smash Punch at Junior High School Level.

The first hypothesis reads, “There is a significant effect of the TGfU learning model on the learning outcomes of smash shots at the junior high school level”. The conclusion in this study can be declared significant if the t value $>$ t table and sig value are smaller than 0.05 (sig $<$ 0.05). Based on the analysis results obtained, the data processing results are as follows.

Table 4. T-Test of Pretest and Posttest Results of Tgfu Learning Model on Learning Outcomes Smash Punch at Junior High School Level

Group	Average	Paired Sample Test				%
		T count	T table	Sig	Difference	
Pretest	19,6250	-13,855	1.696	0,000	2,8125	14,33%
Posttest	22,4375					

From the t-test results in the table above, it can be seen that the significance value (sig) is $0.000 < 0.05$, so this result can be concluded and shows that there is a significant difference. Thus, the alternative hypothesis (H_a), which reads, “There is a significant effect of the TGfU learning model on the learning outcomes of smash shots at the junior high school level”, is accepted.

- b. The Effect of Tgfu Learning Model on Learning Outcomes of Dropshot Punches at Junior High School Level

The second hypothesis in this study reads, “There is a significant effect of the TGfU learning model on the learning outcomes of drop shot shots at the junior high school level”. The conclusion in this study can be declared significant if the t value $>$ t table and the sig value is smaller than 0.05 (sig $<$ 0.05). Based on the results of the analysis, we obtained the following data.

Table 5. T-Test of Pretest and Posttest Results of Tgfu Learning Model on Learning Outcomes Junior High School Dropshot

Group	Average	Paired Sample Test				%
		T Count	T table	Sig	Difference	
Pretest	17,3125	-17,156	1.696	0.000	3,0313	17,50%
Posttest	20,3438					

Based on the t-test in the table above, it can be seen that the significance value (sig) is $0.000 < 0.05$. it can be concluded that there is a significant difference. Thus, the alternative hypothesis

(Ha), which reads, “There is a significant effect of the TGfU learning model on the learning outcomes of drop shot shots on students”, is accepted.

DISCUSSION

The research was conducted at SMP N 2 Gamping, located in the Sleman district, with a sample of 32 7th-grade students. The research process went smoothly with the research implementation plan planned by the researcher. In implementing this study, researchers wanted to know how the tofu learning model affects the learning outcomes of smash and drop shot shots in junior high school students.

The pretest and posttest values in the normality test in this study have a sig value (4-tailed) of 0.310; 0.192; 0.230; 0.224 > 0.05 (The sig value of 4 data is more significant than 0.05), it can be concluded that the pretest and posttest values are normally distributed. The results of the pretest and posttest analysis in this study can also be declared homogeneous because both data have a significance value (sig) of 0.111 and 0,0912 > 0.05, and it can be concluded that the pretest and posttest research data are homogeneous.

The t-test value between the Pretest and Posttest on the learning outcomes of smash shots yielded a significance value (sig) of 0.000, which is less than 0.05. This result and the T count < T table support the acceptance of the alternative hypothesis (Ha). The significant effect of the TGfU learning model on the learning outcomes of Smash shots at the junior high school level is 14.33%. This finding underscores the significant influence and increase in results between Pretest and Posttest. It can be concluded that the TGfU learning model substantially affects learning outcomes in junior high school smash shots.

The application of the TGfU learning model was chosen in the learning process that focuses on junior high school students' smash shots. In the application of the TGfU learning model or tactical game learning model, students are more emphasized on the application of interest and game development structures and strategy development structures used in a game; the TGfU model encourages students always to play the game but only develop techniques and tactics in a proper sequence (Aprianti, 2020).

The t-test value between the Pretest and Posttest on the learning outcomes of drop shot shots obtained a significance value (sig) of 0.000 < 0.05. It obtained T count < T table, which can be interpreted that the alternative hypothesis (Ha) is accepted, a significant influence in applying the TGfU learning model on the learning outcomes of Dropshot shots at the junior high school level, which is 17.50%. Thus, it can be concluded that there is a significant influence or increase in results between pretest and posttest results. It can be interpreted that the TGfU learning model substantially affects the results of junior high school drop-shot shots.

The application of the TGfU learning model in the classroom teaching and learning process for physical education subjects can serve as a model of choice for educators. This model, which emphasizes fun learning and active student participation, can significantly enhance the learning process. As explained by (Estero et al., 2020), the excitement and enthusiasm in participating in the physical education learning process can attract student interest in PE classes, further reinforcing the potential impact of the TGfU learning model.

CONCLUSION

The results of the research that has been conducted at SMP N 2 Gamping with a sample of 32 students consisting of grade 7, which aims to see the tofu learning model on the learning outcomes of smash and drop shot shots at junior high school students, can be concluded by looking at the results of the paired sample T-test test used in this study to calculate the data it can be concluded that there is an effect of the TGfU learning model on the learning outcomes of smash and drop shot shots at the junior high school level. This can be proven by the results of the paired sample T-test independent sample t-test, which has a sig value of 0.000 < 0.05.

REFERENCES

- Arias, A. G., Diloy-Peña, S., Sevil-Serrano, J., García-González, L., & Abós, Á. (2020). A Hybrid TGfU/SE Volleyball Teaching Unit for Enhancing Motivation in Physical Education: A Mixed-Method Approach. In *International Journal of Environmental Research and Public Health*. <https://doi.org/10.3390/ijerph18010110>
- Aryanti, S., Azhar, S., Tangkudung, J., Yusmawati, Y., Ilahi, B. R., & Okilanda, A. (2022). Teaching Games for Understanding (TGfU) Model Learning for Overhead Pass Volleyball in Elementary School Students. In *International Journal of Human Movement and Sports Sciences*. <https://doi.org/10.13189/saj.2022.100407>
- Bathe, C., Fennen, L., Heering, T., Greif, A., & Dubbeldam, R. (2023). Training interventions to reduce the risk of injury to the lower extremity joints during landing movements in adult athletes: a systematic review and meta-analysis. In *BMJ open sport & exercise medicine* (Vol. 9, Issue 2, p. e001508). <https://doi.org/10.1136/bmjsem-2022-001508>
- Cocca, A., Baca, J. E. C., Cruz, G. H., & Cocca, M. (2020). Does a Multiple-Sport Intervention Based on the TGfU Pedagogical Model for Physical Education Increase Physical Fitness in Primary School Children? In *International Journal of Environmental Research and Public Health*. <https://doi.org/10.3390/ijerph17155532>
- Degens, H., Stasiulis, A., Skurvydas, A., Statkeviciene, B., & Venckunas, T. (2019). Physiological comparison between non-athletes, endurance, power and team athletes. *European Journal of Applied Physiology*, 119(6), 1377–1386. <https://doi.org/10.1007/s00421-019-04128-3>
- Estero, J. L. A., Jaquero, P., Martínez-López, A. N., & Morales-Belando, M. T. (2020). Effects of Two TGfU Lessons Period on Game Performance, Knowledge and Psychosocial Variables in Elementary Physical Education. In *International Journal of Environmental Research and Public Health*. <https://doi.org/10.3390/ijerph17103378>
- García-Castejón, G., Camerino, O., Balcells, M. C., Manzano-Sánchez, D., Jiménez-Parra, J. F., & Valenzuela, A. V. (2021). Implementation of a Hybrid Educational Program Between the Model of Personal and Social Responsibility (TPSR) and the Teaching Games for Understanding (TGfU) in Physical Education and Its Effects on Health: An Approach Based on Mixed Methods. In *Children*. <https://doi.org/10.3390/children8070573>
- Husaini, H., Supriatna, E., & Purnomo, E. (2022). Pengaruh variasi latihan target sasaran terhadap kemampuan akurasi smash. *Sriwijaya Journal of Sport*, 1(3), 130–140. <https://doi.org/10.55379/sjs.v1i3.358>
- Ihsan, F., & Nasrulloh, A. (2023). A review of the effects of nutritional supplements on muscle strength and endurance in athletes. *Fizjoterapia Polska*, 23(2), 138–147. <https://doi.org/10.56984/8ZG0DF3B8>
- Ihsan, F., Nasrulloh, A., Nugroho, S., & Kozina, Z. (2024). Optimizing Physical Conditioning Programs for Badminton Athletes: A Comprehensive Review of Training Strategies - A Systematic Review Optimización de programas de acondicionamiento físico para atletas de bádminton: una revisión completa de las estrategias. *Retos*, 54, 488–498. <https://doi.org/10.47197/retos.v54.103208>
- Ihsan, F., Nasrulloh, A., Nugroho, S., & Yuniana, R. (2023). Effect weight training on muscular hypertrophy: a systematic review. *Pedagogy of Physical Culture and Sports*, 27(6), 439–447. <https://doi.org/10.15561/26649837.2023.0601>
- Ihsan, F., Nasrulloh, A., Nugroho, S., & Yuniana, R. (2024). The Effect of Shadow Training and Muscle Endurance on Agility of Badminton Athletes 12-17 Years of Age. *Retos*, 54, 36–45. <https://doi.org/10.47197/retos.v54.103003>
- Ihsan, F., Nasrulloh, A., & Yuniana, R. (2023). Effectiveness of Shadow Training Using Badminton Steps Application in Increasing Footwork Agility on Badminton Athlete. *Sportske Nauke i Zdravlje*, 13(1), 23–30. <https://doi.org/10.7251/SSH23010231>

- Ishak, M., Asmawi, M., Tangkudung, J., Dlis, F., & Sahabuddin. (2022). Smash Training Model in Badminton Game in College Students of the Faculty of Sports Science, Makassar State University. *International Journal of Science and Society*, 4(2), 209–221. <https://doi.org/10.54783/ijsoc.v4i2.463>
- Li, Y., & Chano, J. (2024). The Effects of the Teaching Games for Understanding (TGfU) Mode Adopted in a College Basketball Program. In *Journal of Education and Learning*. <https://doi.org/10.5539/jel.v13n4p134>
- Mousavi Sarvarzi, E., Ramzaninezhad, R., Mohseni Bandpei, M. A., Nezhad Amiri, S., Kordi, R., & Shadmanfaat, S. (2020). Relationship between Muscle Strength, Muscle Endurance, and Agility in Badminton Athletes. *Journal of Environmental Research and Public Health*, 21(1), 1–9. <https://doi.org/doi.org/10.0/ijerph17197149>
- Nathan, S. (2016). Badminton Instructional in Malaysian Schools: A Comparative Analysis of TGfU and SDT Pedagogical Models. In *Springerplus*. <https://doi.org/10.1186/s40064-016-2872-3>
- Pan, Y., Huang, C.-H., & Hsu, W.-T. (2023). A Comparison of the Learning Effects Between TGfU-SE and TGfU on Learning Motivation, Sport Enjoyment, Responsibility, and Game Performance in Physical Education. In *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2023.1165064>
- Puja, E. A., Yendrizar, Donie, & Edmizal, E. (2021). Faktor-Faktor Yang Mempengaruhi Kemampuan Footwork Atlet Bulutangkis. *Jurnal Gladiator*, 1(3), 143–154.
- Rahmat, A. (2021). Badminton Smash Basic Training Model. *INSPIREE: Indonesian Sport Innovation Review*, 2(3), 176–185. <https://doi.org/10.53905/inspiree.v2i3.49>
- Syamsuar, S., & Zen, Z. (2021). Teaching Game for Understanding Model: Increasing Motivation and Students' Physical Fitness. In *Jppi (Jurnal Penelitian Pendidikan Indonesia)*. <https://doi.org/10.29210/02021951>
- Yuvaraj Ramasamy Juliana Usman, V. S. H. T., & King, M. (2021). Kinetic and kinematic determinants of shuttlecock speed in the forehand jump smash performed by elite male Malaysian badminton players. *Sports Biomechanics*, 0(0), 1–16. <https://doi.org/10.1080/14763141.2021.1877336>