

---

**DEVELOPMENT OF TABLE TENNIS TOOLS BASED ON BASIC MOVEMENT PATTERNS TO IMPROVE DRIVE SKILLS**

**Samsuddin Siregar\*<sup>1</sup>, Rosmaini Hasibuan<sup>2</sup>, Budi Valianto<sup>3</sup> & Imran Ahmad<sup>4</sup>**  
<sup>\*1,2,3&4</sup>Health and Recreation Physical Education Study Program, Faculty of Sports Science,  
Universitas Negeri Medan, Indonesia

---

**ABSTRACT**

This research is motivated by the low ability of students in the drive technique in the game of table tennis. This is caused by external factors in the table tennis training process. This is what encourages researchers to develop table tennis aids in table tennis games to improve the skills of novice players' drive stroke techniques. This type of research includes development research, namely developing a tool in the game of table tennis. The development model used in this research is the Borg and Gall development model. The research was conducted at Medan State University with a sample of 60 students. The instrument used in this study consisted of a student performance test. The results showed that table tennis aids consisting of four tools, namely slap ball, spinning ball, bounce board long, and bounce board short used by the table tennis learning group using tools were better than the table tennis learning group without using tools help. Students quickly become skilled at playing table tennis by using the right tools.

**Keywords:** tools, skills, basic techniques, table tennis.

**DOI:**[10.11720/JHIT.54092022.2](https://doi.org/10.11720/JHIT.54092022.2)

---

**1. INTRODUCTION**

This table tennis learning achievement expects students to have the skills to practice various basic table tennis techniques and develop them at school and outside of school. At school, the game of table tennis is one of the material studies of the subjects of physical education, sports and health, graduating college students and prospective sports physical education teachers to teach this sport to students (Haitao et al., 2021). Table tennis is a sport that requires agility so that athletes are able to perform maximum movement and strength (Nikolić et al, 2014).

The learning process for this table tennis course is carried out by relying on tables, bats, balls with various variations of learning through video media (Siregar et al., 2022). The concept of learning like this is certainly not an obstacle for students who already have basic skills in table tennis. However, students who do not have basic skills (beginners) will be a problem, because beginners are first given treatment to improve and form basic movements (Wolf et al., 2015). In order for the stroke to be correct, first the swing treatment until it is skilled and a series of other movements are taught. To build a new training system in the game of table tennis, scientific training methods are needed into daily practice. This means that athletes can continue to update their technique in their game (Chiwen et al. 2019).

Researchers conducted observations to obtain information on the technical skills of students of the Faculty of Sports Science, State University of Medan by using a test method involving 80 students. Observation results obtained 40% of student skills are in the very poor category, 30% of student skills are in the poor category, 20% of student skills are in the good category and 10% are in the very good category. The findings of this observation conclude that there are still many students who have low skills in table tennis. The cause of the low skills of students is due to the limitations of table tennis aids. This limitation causes the volume of students in doing exercise movement activities a little and long waiting for their turn. Then, it causes the results of the strokes to not show the actual basic technical movements seen from the way the hand swings the bat and hitting the bat with the ball does not produce the right shot, the out stroke does not cross the net, and the stroke does not have power and speed.

In line with the results of Junaidi & Mustofa's (2020) research on the development of a table tennis ball throwing device for practice. This research produces a variation of table tennis learning by using an ejection machine. The results obtained indicate that variations in table tennis learning are very appropriate to be used in table tennis learning. Herliana's research (2019) also examines the effect of training using two tables to see forehand accuracy in table tennis games. The results obtained indicate that the field of sports, especially table tennis is very appropriate to practice using two tables in an effort to improve the athlete's forehand accuracy.

Forehand strokes have great power compared to backhand strokes because the hitting position is not blocked by the body (Girard et al, 2010).

This tool was developed according to the results of the analysis of the basic movement patterns of each basic technique in the game of table tennis. Psychological factors and movement skills will be considered in the development of this tool (Hurlock, 1991). To help students in practicing basic table tennis techniques, this tool is very useful in improving student weaknesses. In addition, this tool can also increase the student's long-term memory through the design of models that are suitable for the number of students, so that users can perform repetitive movements for a long time.

## 2. LITERATURE REVIEW

Table tennis is a game sport whose development has been popular, both among education and among the public. Larry Hodges (1996) is a game in which a small ball is hit back and forth on the table, until someone makes a mistake to earn a point. This opinion explains that for every mistake there must be points, the accumulated points obtained determine the victory of each player. Afee (2009) also explained that table tennis is a sport that requires a combination of explosive power from the feet and fine motor skills in the hands. The main focus at the beginning was developing hand skills to control the ball. Reinforced by Hanif (2011) who explains that table tennis is a recreational sport and is very popular with both children, those who are young and those who are somewhat elderly and the elderly, both in big cities and in regions. even in every village there is a table tennis court. Sutanto (2016) also defines table tennis as a racket sport played by two people or two opposing pairs.

To be able to play table tennis, players must first master the basic techniques in this game. Technique is a series of movements used to display efficient and effective movement skills. The punching technique in table tennis can be interpreted as a hand movement to hit the ball with a bat so that the ball passes through the net/crosses into the opponent's field. As mentioned by Afee (2009) that the technique of hitting the ball is a certain way to hit the ball so that it passes over the net. In table tennis, hitting techniques can generally be grouped into attacks that are offensive and defensive strokes, and based on the type, the technique of hitting in table tennis consists of; drive, push, block, smash, hit, serve, halley volley, side slip shot, loop, flip, drop shot, lob and chop (Afee, 2009). To learn this technique, fast-paced players must of course go through a regular learning process. Players must be skilled in every basic movement pattern of each of the above techniques, such as preparatory movements, execution movements and final stance movements. The movement patterns and swinging techniques of each technique are certainly different, for this reason, players need to be patient in practicing their abilities and choosing the right tools to produce good skills.

Learning aids are one of the components that must be considered and this is something important to present in table tennis learning (Sung & Mayer, 2012). Through these tools, it will be easier for educators to teach the basic techniques in the table tennis game. According to Lyna (2012), tools are communication channels or intermediaries used to carry or convey messages in order to achieve learning objectives. Meanwhile, Hujair (2013) explains that learning aids are tools that function and can be used to clarify learning messages. Functionally, learning aids are expected to help facilitate the learning process of various existing basic techniques, so that it is easier for students to learn various basic movements, interaction between educators and students will be more active (Purvis et al., 2020). The tools that will be developed in this study are tools that can be used as training tools to train table tennis hitting skills so that players are skilled in placing/directing the ball and hitting motion skills. The tools are made of easily available home materials such as flexible wire, thick triplex, and modified balls.

The tool was developed based on the analysis of the needs for movement characteristics of the basic table tennis techniques and the characteristics of students. Characteristics of motion are elements of a series of interrelated movements, and if done correctly it will produce skills. In this development research, the tools that will be developed for the needs of the basic technique of the drive stroke and the basic technique of the spin stroke. The four basic techniques are techniques that are difficult to learn, but if players master these techniques, players can master the game better. The following is the design of the development tool that will be made.

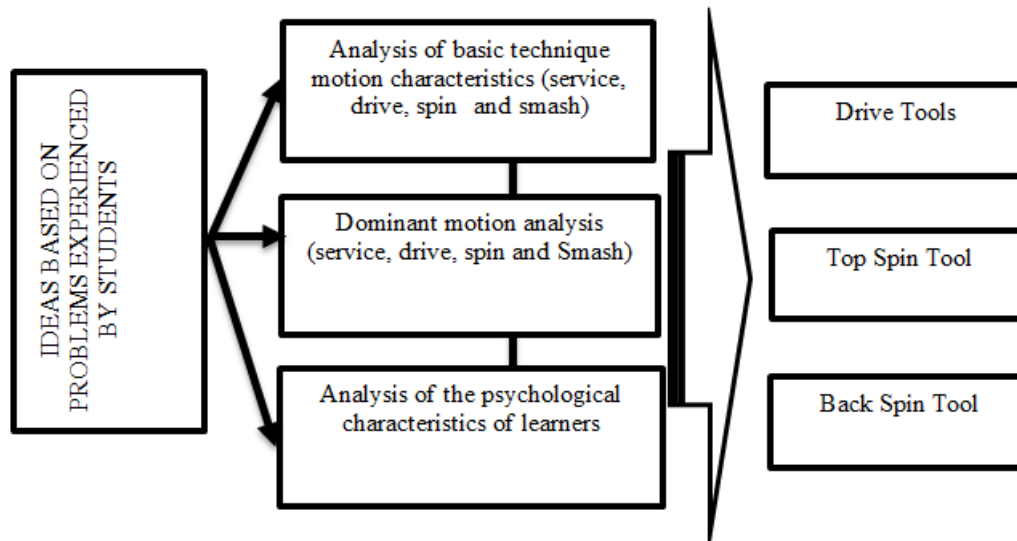


Figure 1. Basic Development of Table Tennis Aids

Characteristics of students are seen from their movement abilities and psychological aspects, and this is also one of the basics in the development of this tool. In general, students tend to want more fun learning, so in developing the design of this tool and its application it will be designed as well as possible. Another thing to note is the safety of using this tool. These tools have materials and designs that are safe for students to use, both individually and in groups. The developed tools are arranged in seven components, namely concepts, learning objectives, material to be studied, syntax or steps for use in learning, teacher and student activities, and assessment of learning outcomes.

(Rusli Lutan, 1988) argues that motor skills are a process in which a person develops a set of responses into a coordinated, organized, and integrated movement. Another opinion from (Oxendine, 1984) states that simple motor skills usually involve a small number of connections, while complex skills may require several motor connections. Meanwhile (Hurlock, 1991) defines motor skills as the development of physical movement control through coordinated nerve and muscle activities. Opinion (Richard A. Magill, 2011) also mentions that skills in general are an activity that has a goal to achieve goals in a timely manner (Bechar & Grosu, 2015). Developing and improving movement skills is a multi-aspect task, because it is not enough just to practice if you want to improve these skills, but many aspects must be the basis, especially in designing tasks/activities given to students (Wang et al., 2021). Quoted from (Amung Ma'mun, 2000). (Reki Siaga Agustina1, Agus Mahendra, 2019) stated that motor skills have a good influence on complex movements.

**3. RESEARCH METHOD**

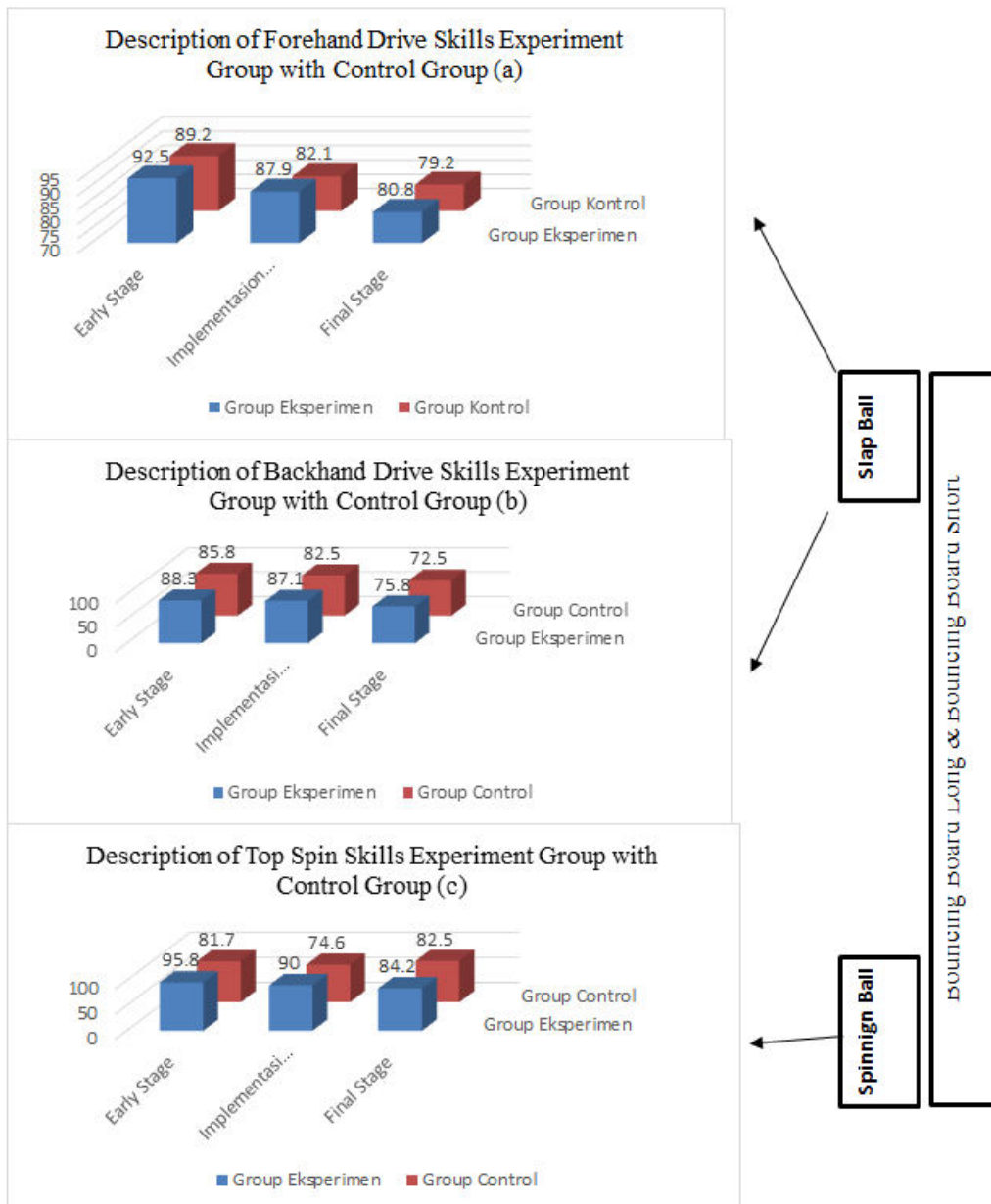
This study uses research and development (R&D) which refers to the development model (Borg & Gall, 2007). The approach in this research uses mixed methods research, namely an approach that combines quantitative and qualitative methods. This approach is considered to be able to reach or process all data or information so that more comprehensive information will be obtained. The research was conducted at the Faculty of Sports Science, State University of Medan, Jalan Willem Iskandar Pasar V Medan Estate, Medan, North Sumatra in March-August 2022.

This research is a learning research, the time of the research is adjusted to the table tennis lecture schedule. The trial subjects in this study were 60 students of the Health and Recreation Physical Education Study Program who were actively studying. To see how effective the tools developed in improving students' basic table tennis technical skills are, the test equipment used to measure these two objectives is by using tests, documentation, and interviews. The data were analyzed using the percentage formula  $P = \frac{x}{xi} \times 100$ .

| Percentage | Description | Meaning     |
|------------|-------------|-------------|
| 80%-100%   | Valid       | Can be used |
| 60%-79%    | Quite Valid | Can be used |
| 50%-59%    | Not Valid   | Replaced    |
| <50%       | Invalid     | Replaced    |

**4. RESEARCH RESULTS AND DISCUSSION**

The study was conducted to test the effectiveness of the tools called slap ball, spinning ball, bouncing board long, and bouncing board short. The effectiveness test was carried out to obtain information on the accuracy of the tool in achieving the goal of improving students' hitting technique skills. In this effectiveness test, it involved 60 students (30 for the experimental group and 30 for the control group. Both groups were both learning or practicing the table tennis stroke technique. Only the experimental group used learning tools, and the control group did the learning without using a tool. After the two groups did the learning, then a test was conducted to measure the skill level of the two groups. Then the test data were analyzed. The following diagram shows the results of the skill test of the experimental group and the control group.



**Figure 2.** Diagram of Effectiveness Test Results

The three diagrams above are an illustration of the results of the tool effectiveness test from the experimental group and the control group. Slap ball, bouncing board long, and bouncing board short are tools for beginners to improve their drive technique. Judging from the data in diagram (a) above, it can be seen that the skill level of the forehand drive technique in the experimental group was 30 students. in the preparation stage it reached 92.5%, the implementation stage reached 87.9% and the final stage reached 80.8%. Meanwhile, the skill level of the control group of 30 students in the preparatory stage was 85.8%, the implementation stage was 82.1% and the final stage was 79.2%.

Based on the data from the effectiveness test of this tool, it can be concluded that the skill level of the forehand drive technique of the experimental group who learns the drive technique using a slap ball is better than the control group (learning the forehand drive technique) which only relies on a table, bet, ball with other words without training aids. Then, seen from the data diagram (b) above, it can be seen that the skill level of the backhand drive technique in the experimental group was 30 students. in the preparation stage it reached 88.3%, the implementation stage reached 87.1% and the final stage reached 75.8%. Meanwhile, the skill level of the backhand drive technique in the control group of 30 students in the preparation stage was 85.8%, the implementation stage was 82.5% and the final stage reached 72.5%. Based on the data from the effectiveness test of this tool, it can be concluded that the skill level of the backhand drive technique in the experimental group who learned the backhand drive technique using a slap ball was better than the control group (learning backhand drive technique) without any training aids.

Then test the effectiveness of the spinning ball, bouncing board long, and bouncing board short tools. From diagram data (c) above, it can be seen that the skill level of the top spin technique in the experimental group was 30 students. in the preparation stage it reached 95.8%, the implementation stage reached 90% and the final stage reached 84.2%. Meanwhile, the skill level of the control group's top spin technique was 81.7% in the preparation stage, 74.6% in the implementation stage and 82.5% in the final stage. Based on the data from the effectiveness test of this tool, it can be concluded that the skill level of the top spin technique in the experimental group who learns the top spin technique using a spinning ball is better than the control group (learning top spin technique) which only relies on tables, bets, balls. in other words without training aids.

## 5. DISCUSSION

Based on the results of the preliminary study and information collection conducted at the beginning of this study, it was shown that the students' skills in the drive and spin techniques were lacking. From the information data, it is designed learning aids that are very helpful in overcoming student problems and this tool is also liked. This tool was developed from simple materials and has gone through a process of analysis, expert testing, small group and large group tests by users (students). The results showed that the drive technique and spin technique of the experimental group were better than the control group. The experimental group is better of course because the tools used are slap ball, spinning ball, long bouncing board, and short bouncing board.

As the results of Furqon's research (1995) which states that the developed tool is a tool that can be used as a training tool to help novice players in doing drive and spin exercises, this tool is designed to correct hand swings when preparing to hit and help correcting the bets with table tennis balls made by students. This tool is easy to use, students can use this tool outside of study time, so they can use it independently. This tool is effectively used as a training tool for table tennis drive and spin techniques, this is based on the effectiveness test data described above. Indeed, when this tool is used in learning, it is necessary to pay attention to the aspect of the number of tools provided with the number of students, it is necessary to adjust the ratio of the tool to the number of students. According to the researcher, the ratio of 1:3 students can be adjusted, this is done so that students have more opportunities to do exercises.

Tools to improve, provide experience so that learning objectives are achieved are important things to be involved in any learning activities, including learning that requires movement skills, such as table tennis. Movement will be difficult to train without tools, in another sense a movement can be skilled if assisted with tools and given a systematic, measurable and continuous program. In terms of optimization, Bompa (1994) states that exercise is part of one's efforts to optimize the improvement of the organism and its functions to support achievement and performance. However, realizing this requires a systematic, measurable and continuous process that is not easy enough to implement. For that, we need a good way so that the training program provided by the coach supports the quality of training that is in accordance with each branch. Not only physical training that must be trained to achieve maximum performance, technical, tactical and mental are also very important. (Devaji et al., 2020) strengthens that educators need to understand that the function of learning aids is to make the teaching and learning process more efficient and effective in achieving learning objectives, but it is also necessary to understand that not all learning objectives can be achieved with assistive devices, in the sense that without using learning aids, the goal can be achieved.

## 6. CONCLUSION

After going through various analysis processes, expert tests, small group and large group tests, effectiveness tests and the results of the data analysis above, it can be concluded that the experimental group who learns the basic techniques of drive and top spin using slap ball, spinning ball, bouncing board long, and bouncing board short had better skills compared to the control group who did learning without using tools. Thus the slap ball,

spinning ball, bounce board long, and bounce board short tools are effectively used to improve the skills of novice players in the basic techniques of forehand drive, backhand drive and table tennis top spin.

## REFERENCES

- [1] Amung Ma'mun, Y. M. S. (2000). *Perkembangan Gerak dan Belajar Gerak*. Departemen Pendidikan dan Kebudayaan. Indonesia.
- [2] Bechar, I., & Grosu, E. F. (2015). An Applicable Physical Activity Program Affecting Physiological and Motor Skills: The Case of Table Tennis Players Participating in Special Olympics (SO). *Procedia - Social and Behavioral Sciences*, 209(July), 247–253. <https://doi.org/10.1016/j.sbspro.2015.11.227>
- [3] Borg, W.R. & Gall, M. D. G. (2007). *Educational Research: An Introduction*, Eighth Edition. Longman, Inc.
- [4] Chiwen, Shen, Zhang Tong, Gu Nan, Zhu Ling, and Wang Hao. (2019). "Comparison and Analysis of the Techniques and Tactics of Zhang Jike Using New Plastic Ball and Celluloid Ball in the Match." *Proceedings Book of the 16th ITTF Sports Science Congress* 113–17.
- [5] Dehkordi, A. G. (2011). The effect of instructional-aid films on learning of table tennis techniques. *Procedia Social and Behavioral Sciences*, 15, 1656–1660. <https://doi.org/10.1016/j.sbspro.2011.03.348>
- [6] Devaji, J. P., Iyer, N., Kotabagi, S. S., & Kabbur, A. M. (2020). Industry institution education at undergraduate level: Changing role of the educator. *Procedia Computer Science*, 172(2019), 718–722. <https://doi.org/10.1016/j.procs.2020.05.102>.
- [7] Girard, Olivier, Frank Eicher, Jean-Paul Micallef, and Grégoire Millet. (2010). "Plantar Pressures in the Tennis Serve." *Journal of Sports Sciences* 28(8):873–80.
- [8] HaitaoHAO, Sbeih, A., & Shibly, F. H. A. (2021). Physical education and its role in improving the health of college students by active participation and optimization by deep learning. *Aggression and Violent Behavior*, 101628. <https://doi.org/10.1016/j.avb.2021.101628>
- [9] Hanif, Ahcmad Sofyan. (2011). *Model Pembelajaran Permainan Tennis Meja*. Bumi Timur Jaya.
- [10] Hurlock, E. B. (1991). *Psikologi Perkembangan Suatu Pendekatan Sepanjang Rentang Kehidupan*. Penerbit Erlangga.
- [11] Jowett, R., & McMullan, M. (2007). Learning in practice - practice educator role. *Nurse Education in Practice*, 7(4), 266–271. <https://doi.org/10.1016/j.nepr.2006.08.008>
- [12] Junaidi, A., & Mustofa, H. (2020). Pengembangan Variasi Pembelajaran Tenis Meja Menggunakan Ejection Machine an Tenis Tenis Meja Menggunakan Ejection Machine IKIP Budi Utomo Malang Keywords : Development , Variations of Learning , Ejection Machine , Table Tennis Ahmad Junaidi dan Habibulloh Must. 9(2), 52–60.
- [13] Larry Hodges. (1996). *Table Tennis; Step to Succes*. Rajagrafindo Persada.
- [14] M.Furqon, D. (1995). *Teori Umum Latihan* (UNS (ed.)). Universitas Sebelas mat=ret.
- [15] Mc.Afee Richard. (2009). *Table Tennis : Steps To Success*. Human Kinetics Inc.
- [16] Oxendine, J. B. (1984). *Psychology Of Motor Learning*. New Jersey: Prentice Hall Inc.
- [17] Pendidikan, F., Indonesia, U. P., Setiabudhi, J., & Bandung, N. (2017). Pengembangan Teknologi Alat Pelontar. 02(02), 51–55.
- [18] Purvis, A. J., Rodger, H. M., & Beckingham, S. (2020). Experiences and perspectives of social media in learning and teaching in higher education. *International Journal of Educational Research Open*, 1(October), 100018. <https://doi.org/10.1016/j.ijedro.2020.100018>
- [19] Reki Siaga Agustina1, Agus Mahendra, T. J. (2019). The Effect of Practise Method and Motor Ability on Improving Complex Motor Skills in Football Games. *Jurnal Pendidikan Jasmani Dan Olahraga*, 4(2), 168–175. <https://doi.org/http://ejournal.upi.edu/index.php/penjas/index>
- [20] Richard A. Magill. (2011). *Motor Learning & Control*. McGraw-Hill.
- [21] Rusli Lutan. (1988). *Belajar Keterampilan Motorik: Pengantar Teori dan Metode*. Dirjen Dikti-Depdikbud.
- [22] Samsuddin Siregar. (2020). Efektivitas Model Pembelajaran Berbasis Permainan dalam Meningkatkan Keterampilan Forehand Drive Mahasiswa. *Jurnal Ilmu Keolahragaan*, 19(1), 54–62. <https://doi.org/https://doi.org/10.24114/jik.v19i1.18455>
- [23] Siregar, S., Kasih, I., & Pardilla, H. (2022). The Effectiveness of E-Learning-Based Volleyball Service Video Media on Students Affected by Covid-19 at Faculty of Sports Science, Universitas Negeri Medan. *Teoriâ Ta Metodika Fizičnogo Vihovannâ*, 22(1), 7–13. <https://doi.org/10.17309/tmfv.2022.1.01>.
- [24] Sung, E., & Mayer, R. E. (2012). Affective impact of navigational and signaling aids to e-learning. *Computers in Human Behavior*, 28(2), 473–483. <https://doi.org/10.1016/j.chb.2011.10.019>.
- [25] Sutanto Teguh. (2016). *Buku Pintar Olahraga*. Pustaka Baru Press.
- [26] Wang, W., Qu, F., Li, S., & Wang, L. (2021). Effects of motor skill level and speed on movement variability during running. *Journal of Biomechanics*, 127(August), 110680. <https://doi.org/10.1016/j.jbiomech.2021.110680>.

- [27] Wolf, S., Brölz, E., Keune, P. M., Wesa, B., Hautzinger, M., Birbaumer, N., & Strehl, U. (2015). Motor skill failure or flow-experience? Functional brain asymmetry and brain connectivity in elite and amateur table tennis players. *Biological Psychology*. <https://doi.org/10.1016/j.biopsycho.2015.01.007>.