JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

Original Article Research

The Development of Physical Activities Based on Racket Striking for Early Childhood Education Students in Yogyakarta City

Afif Khoirul Hidayat[1]*, Sri Susilowati[2], Desk Ayu Suartini[2], Sri Hastina[3], Rahmawan Santoso[4], Zainul Aziz[5], Thadius Yambedoan[6]

[1]*Physical Education, Health and Recreation Department, Faculty of Teacher Training and Education, Musamus University, Merauke, Indonesia*

[2] *TK Pembina Yogyakarta, Yogyakarta, Indonesia*

[3] *TK Negeri 2 Yogyakarta, Yogyakarta, Indonesia*

[4]*Sport Education, Faculty of Teacher Training and Education, Sriwijaya University, Palembang, Indonesia*

[5]*Physical Education, Health and Recreation, Faculty of Social Sciences Education, Semarang PGRI University, Semarang City, Indonesia*

[6]*Sports Science, Faculty of Sports Science, Yogyakarta State University, Indonesia*

*email corresponding author: *afif@unmus.ac.id*

Abstract

This research aims to develop physical activities based on racket striking that are suitable for early childhood education children in Yogyakarta City. The research method employed is a simplified version of the Research & Development (R&D) model, which condenses the original ten stages into four main phases: Information Gathering, Development of Preliminary Product Form and Validation, Operational Field Testing, and Final Product Revision. The research subjects consisted of 64 ECE students from four schools in Yogyakarta City, selected using a proportional total sampling technique. The data analysis methods used were the Aiken V test and Dependent t-test. The research findings indicate that physical activities based on racket striking have an Aiken V value of 0.83, which signifies high validity. In the Operational Field Testing, it was found that the effectiveness of physical activities based on racket striking had a dependent t-test significance value of 0.00; thus it can be concluded that the physical activities based on racket striking can be used as a practical learning material to support the motor development of young children while considering safety aspects and its alignment with the developmental stages of children.

Keywords: Physical, Racket, Childhood, Student.

How to cite:

Hidayat, A. K., Susilowati, S., Suartini, D. A., Hastina, S., Santoso, R., Aziz, Z., & Yambedoan, T. (2025). The Development of Physical Activities Based on Racket Striking for Early Childhood Education Students in Yogyakarta City. *JUMORA: Jurnal Moderasi Olahraga, 5*(1), 61–74. https://doi.org/10.53863/mor.v5i1.1548

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

1. INTRODUCTION

Physical activity is fundamental in supporting young children's development, particularly in gross motor skills, coordination, and physical health. According to Sutapa et al., (2021) early childhood, often called the golden age, is a critical period in which physical stimulation significantly impacts a child's growth and development. Physical activity in early childhood supports motor development and enhances cognitive and social abilities (Dapp et al., 2021) (Tandon et al., 2020). Furthermore Caldwell et al., (2020) assert that structured physical activity, appropriately aligned with the child's developmental stage, can help lay the foundation for more complex physical skills in the future. Therefore, educators and parents must ensure that young children engage in enjoyable physical activities to support their holistic development.

Many early childhood education institutions still rely on conventional physical activities such as gymnastics and walking around the neighborhood, which are considered less varied in providing motor stimulation for children. According to research Ku, (2020), monotonous physical activity diminishes children's interest and limits their opportunities to develop more complex motor skills. This aligns with the findings of Irawan et al., (2021) and Biino et al., (2023), who states that variation in physical activity is crucial for stimulating both gross and fine motor development in a balanced manner. Developing innovative and engaging physical activities can enhance children's participation and encourage them to be more physically active (Caldwell et al., 2020) (Shahidi et al., 2020) (Kellstedt et al., 2021) . Therefore, innovation is needed in designing physical activities that are not only enjoyable but also capable of meeting the developmental needs of young children.

Physical activity-based racket sports have great potential in training hand-eye coordination, balance, and muscle strength in young children. According to Duncan et al., (2020), activities involving striking movements in racket sports can stimulate the development of gross motor skills and improve children's coordination abilities. However, equipment such as standard badminton rackets is often unsuitable for young children due to their size and weight, which can hinder children's participation (Rojas-Valverde et al., 2021) (Nor Azmi et al., 2024). Additionally, many early childhood educators lack the necessary skills or knowledge to introduce physical activity-based racket sports to their students, as noted by (Morales-Campo et al., 2025). Therefore, developing appropriate tools and methods that match young children's capabilities, along with training for educators to implement these activities effectively, is essential.

Based on observations and interviews with various early childhood education educators in Yogyakarta City, the physical activities most commonly implemented are still quite general, such as gymnastics, community service for environmental cleaning, and walking around the neighborhood. According to Juniarti (2019) only 10% of the 25 children engage in physical activity through exercise movements, and they are the ones who perform the movements earnestly and to the fullest. Meanwhile, physical activity-based racket sports have not been widely explored. Physical activity variation is crucial to holistically supporting children's motor development (Sääkslahti & Niemistö, 2021) (Dapp et al., 2021). Furthermore, no research has explicitly focused on developing physical activities based on the racket for young children. Physical activities involving hand-eye coordination, such as racket play, can significantly benefit children's motor development, as stated by (Johor et al., 2020). Therefore, there is a need for research that develops physical activity-based racket striking tailored for young children to support their motor development optimally.

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

The results of focus group discussions (FGDs) with various early childhood education educators indicate that teaching physical activities based on racket striking will face several challenges. Equipment such as standard rackets tends to be too heavy and large for young children, making them difficult to use (Touzard et al., 2023) (Nor Azmi et al., 2024). The varied motor development levels among young children make it challenging to design activities suitable for all children, as highlighted by (Rizki & Aguss, 2020). early childhood education teachers often lack sufficient training to teach racket activities, thus requiring more intensive guidance and support (Rahman et al., 2024) (Morales-Campo et al., 2025). Moreover, the underdeveloped hand-eye coordination of young children also poses a barrier to performing racket-striking movements. This study aims to address these issues by developing physical activities based on racket striking suitable for young children while guiding teachers on how to implement them effectively.

This study aims to develop physical activities based on racket striking suitable for early childhood education children, considering safety aspects, equipment suitability, and the children's developmental stages. Physical activities designed for young children must consider their motor skills and safety. Innovative and engaging physical activities can enhance their participation and promote their motor development and coordination. The benefits of this research are to provide an alternative innovative physical activity for early childhood education children and improve their gross motor skills and hand-eye coordination. This study is expected to positively contribute to developing physical activity curricula in early childhood education settings. In conclusion, this research will help create more effective and enjoyable physical activities that support the overall development of early childhood education in Yogyakarta City.

2. METHOD

2.1 Participants

The subjects in this study were 64 students aged 4-6 years from four public kindergartens in Yogyakarta City. The breakdown is as follows: 16 students from TK Pembina Yogyakarta, 16 students from TK Negeri 2 Yogyakarta, 16 students from TK Negeri 4 Yogyakarta, and 16 students from TK Negeri 11 Yogyakarta. The study subjects were selected through a preliminary study to ensure that the school authorities, teachers, and students were willing to participate in developing physical activities based on racket striking research. The sampling process was conducted using a proportional total sampling technique, which involved all subjects aged 4-6 years who were willing, interested, and nominated by the respective school principals and teachers to participate in this study.

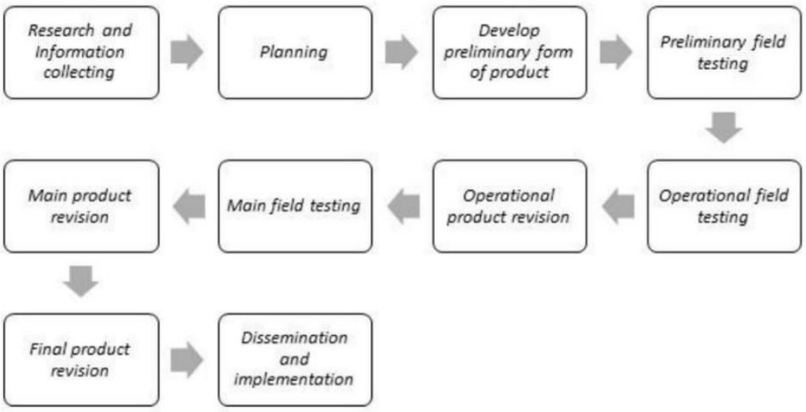
2.2 Research Design

This study uses the Research & Development (R&D) model from (Borg & Gall, 2003), consisting of 10 stages: (1) Research and Information Gathering, (2) Planning, (3) Development of Preliminary Product Form, (4) Preliminary Field Testing, (5) Main Product Revision, (6) Main Field Testing, (7) Operational Product Revision, (8) Operational Field Testing, (9) Final Product Revision, (10) Dissemination and Implementation. If these 10 stages were presented in a diagram, it would appear as follows:

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

Figure 1.

Steps of The Development Model According To Borg & Gall



To address the funding and time limitations for the research and apply the principle of efficiency in the study, the Research & Development (R&D) stages need to be simplified. According to Isna Nurul Inayati and Mita Dewi Ningsih (2024), the 10 Research & Development (R&D) stages can be simplified into four phases. In the development of physical activities based on racket striking, the research stages are simplified as follows: (1) Information Gathering, (2) Development of Preliminary Product Form and Validation, (3) Operational Field Testing, and (4) Final Product Revision.

2.3 Instruments

The instruments used in this study are divided into two types: (1) a validation questionnaire for expert judgment and (2) an observation sheet to measure student participation levels. The validation questionnaire in this study was completed by one academic expert in early childhood education, one academic expert in early childhood sports, and four practitioners in early childhood education. The validation questionnaire for the physical activities based on racket striking product consists of 4 indicators, with each indicator containing four statements, resulting in a total of 16 statements. The indicators in the validation questionnaire for the r physical activities based on racket striking product are (1) Age Appropriateness, (2) Safety, (3) Duration and Intensity, and (4) Curriculum Integration.

An observer fills out the observation sheet in this study to assess the level of student participation during routine physical activities organized by the school, such as gymnastics, community service, and walking around the neighborhood, as well as the level of involvement during physical activities based on racket striking. The observation sheet for student participation is divided into five indicators, each consisting of 2 observation items, resulting in 10 checklist items for observing student participation levels. The indicators for student participation are: (1) Active Engagement, (2) Movement Intensity, (3) Emotional Expression, (4) Social Interaction, and (5) Creativity and Initiative.

2.4 Procedures

The feasibility test was conducted through product validation through expert judgment by five early childhood education experts: one academic expert in early childhood education, one

academic expert in early childhood sports, and four practitioners in early childhood education. The validation process in this study took place during the second stage of the research, after the information-gathering stage, and before the operational field testing stage. The physical activities based on racket striking products for young children are considered suitable for proceeding to the operational field testing stage if they have been validated and deemed appropriate by all early childhood education experts. If the product is not valid or suitable, it must be revised continuously until it meets the required validity and suitability for use in the operational field testing process.

In this study, the effectiveness test was conducted by comparing the data on student participation levels during physical activities based on racket striking with data on student participation levels during routine physical activities organized by the school, such as gymnastics, community service, and walking around the neighborhood. The participation data was gathered through observation sheets filled out by the observer during the physical activity process. In this study, the observer is a neutral subject, separate from the researchers and the teachers of the students being studied. This approach ensured that the student participation data was truly objective and free from bias.

2.5 Data Analysis

The data analysis technique applied in this study is quantitative descriptive analysis, which includes the V Aiken values test and the dependent t-test. The V Aiken values test is conducted to determine the validity of the developed physical activities-based racket striking product. The validation data, which is then tested using the V Aiken values formula, was obtained through the completion of the questionnaire by five validators, consisting of one academic expert in early childhood education, one academic expert in early childhood sports, and four practitioners in early childhood education. In this study, the V Aiken values were calculated with the help of SPSS version 23. The following is the formula for calculating V Aiken values:

$$V = \frac{\sum s}{n(e-1)}$$

Explanation:
V = V Aiken validity index
s = r-*lo*
lo = Lowest rating value
n = Number of raters
c = Number of categories that the raters can select

The dependent t-test is used to assess the effectiveness of the developed product, precisely to measure whether the physical activities based on racket striking products can enhance student participation in physical activities. In this study, the dependent t-test was calculated with the help of SPSS version 23. The following is the formula for the dependent t-test used in this study:

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

$$t = \frac{\bar{d}\sqrt{n}}{s_d}$$

Explanation: d = The difference between paired data values

$\bar{d}$ = The mean of the d values

S_d = The standard deviation of the d values

The reason for choosing student participation levels as a benchmark for the developed product's effectiveness is that early childhood education's core objective is to introduce students to various learning materials in the form of play without using tests and exams. Therefore, it would be highly inappropriate to subject children aged 4-6 years to tests and examinations merely to assess the effectiveness of the product developed in this study.

3. RESULTS

The results of the information-gathering stage in this study indicate an urgent need to develop more varied physical activities that are appropriate for the developmental stages of young children in early childhood education institutions. Based on observations and interviews with early childhood education educators, it was found that everyday physical activities, such as gymnastics and walking, tend to be monotonous and do not sufficiently stimulate children's motor development. The literature review confirmed that more diverse and innovative physical activities, such as physical activities based on racket striking, can positively impact gross motor skills, hand-eye coordination, and increased student participation. Additionally, an analysis of existing products and policies revealed that equipment such as standard rackets is unsuitable for young children, both in size and weight, thus hindering their participation in these physical activities. Therefore, identifying these issues and needs is the foundation for designing more effective and engaging physical activities for young children.

In the develop preliminary form of product stage, this study successfully designed a series of physical activities specifically tailored for young children, focusing on gross motor skills and body coordination through rackets. The first activity, Racket Balance, aims to develop gross motor skills and body coordination by balancing various objects on the racket. Through this activity, the children are also trained to problem-solve and adapt strategies to face challenges with varying difficulty levels. additionally, the racket balloon striking activity introduces children to more complex hand-eye coordination to develop gross motor skills while enhancing their ability to adapt and self-regulate when moving in their personal space. Each activity is designed to create an enjoyable experience while supporting balanced physical development.

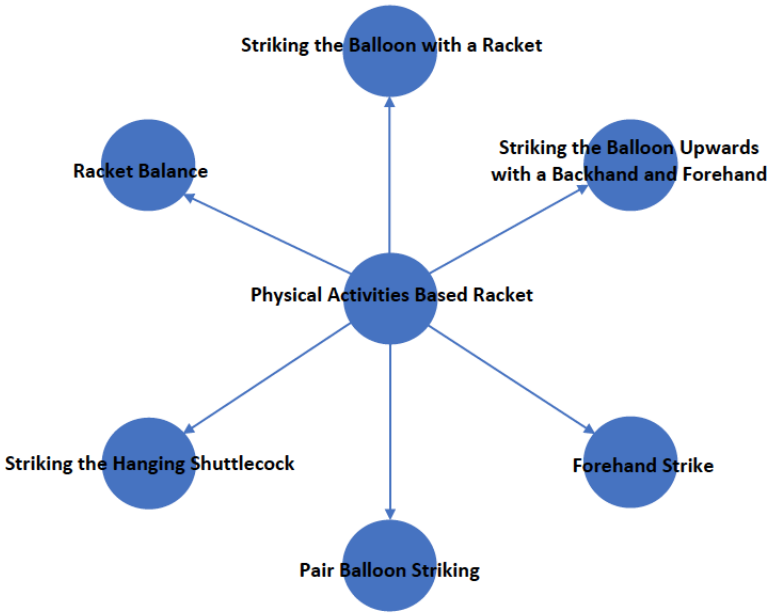
The subsequent activities, such as striking the balloon upwards with a backhand and forehand, aim to train accuracy, hand-eye coordination, and control over the strength and direction of the strike. In the forehand strike activity, students are encouraged to maintain the balloon's movement within their personal space, which allows them to develop perseverance and control when striking the balloon consecutively. The pair balloon striking activity will enable children to interact and collaborate, enhancing their social skills while continuing to develop gross motor

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

skills and hand-eye coordination. Finally, in the hanging shuttlecock strike, children are trained to improve their accuracy and essential coordination as they strike the hanging shuttlecock, demonstrating their ability to control their movements patiently before making the next strike. This initial product has been designed considering early childhood development and has subsequently been validated by experts to ensure its effectiveness in supporting children's motor development. If the physical activities based on racket striking for early childhood education students were presented in a diagram, it would appear as follows:

Figure 2.

Design of Physical Activities Based on Racket Striking for Early Childhood Education Students



In the Validation stage, the physical activities based on racket striking were validated by five experts, including one academic expert in early childhood education, one in early childhood sports, and four practitioners in early childhood education. The validation process was carried out using a questionnaire consisting of four primary indicators: (1) Age Appropriateness, (2) Safety, (3) Duration and Intensity, and (4) Curriculum Integration. Each indicator contained four statements, resulting in 16 statements that needed to be evaluated by the experts. To assess the feasibility of this product, the V Aiken values test was conducted, aiming to determine the extent to which the product meets the criteria for validity and suitability for use in the Operational Field Testing stage. The following table shows the V Aiken values test results for the physical activities based on racket striking product for Early Childhood Education students.

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

Table 1.

V Aiken Values *of Physical Activities Based on Racket Striking for Early Childhood Education Students*

	E_1	E_2	E_3	E_4	E_5	Mean
Mean	4,34	4,13	4,44	4,25	4,75	4,39
Standard Deviaton	0,62	0,81	0,51	0,58	0,45	0,59
Achievement Percentage	70%	66%	71%	68%	76%	70,2%
V Aiken Values						0,83

The data above indicates that the Aiken's V value is 0.83, which means that the racket-based physical activities are considered valid and ready to be implemented in the operational field testing process. This high validity score suggests that the content of the activities has been carefully reviewed and deemed appropriate by experts in the field. With a value above the standard threshold, it reflects that the activities are relevant and effective for use in the targeted educational settings. As a result, this validation ensures that teachers can confidently incorporate these activities into their physical education programs, knowing that they align with the intended learning outcomes and contribute to the development of students' physical skills.

In the operational field testing stage, the implementation of physical activities based on racket striking was conducted at four kindergartens in Yogyakarta: TK Pembina Yogyakarta, TK Negeri 2 Yogyakarta, TK Negeri 4 Yogyakarta, and TK Negeri 11 Yogyakarta, with a total of 64 students involved. Data on student participation levels were collected before and after the implementation of the physical activity to measure its impact on their engagement in physical activities. Subsequently, a dependent t-test was conducted to analyze the significant differences in student participation levels before and after implementing physical activities based on racket striking. The results of the dependent t-test showed a substantial increase in student participation levels, indicating that the physical activities based on racket striking successfully enhanced student engagement in physical activities and had the potential to develop their motor skills. The following is a table presenting the data from the dependent t-test on student participation in physical activities based on racket striking for Early Childhood Education students.

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 5, No. 1, June 2025
DOI: 10.53863/mor.v5i1.1548
Universitas Ma'arif Nahdlatul Ulama Kebumen

Table 2.

Dependent t Test of Physical Activities Based on Racket Striking for Early Childhood Education Students

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Partisipasi Akhir - Partisipasi Awal	12.688	2.754	.344	12.000	13.375	36.858	63	.000

Based on the table above, it can be observed that the significance value of the dependent t-test for student participation in physical activities based on racket striking for Early Childhood Education students is 0.00, which is smaller than 0.05. This indicates a significant difference in student participation levels before and after implementing physical activities based on racket striking. Therefore, it can be concluded that physical activities based on racket striking have a significant positive impact on increasing student engagement in physical activities. As a result, this physical activity is deemed suitable as an alternative learning material in early childhood education programs in Yogyakarta City. With this finding, it is hoped that teachers will broaden the variety of physical activity learning materials for young children, not only limited to gymnastics or walking around the neighborhood but also include more innovative and enjoyable activities such as racket striking.

In the final product revision stage, improvements were made to the design and content of the physical activities based on racket striking based on the operational testing results and feedback from teachers and school principals. One of the suggested improvements was the adjustment of the activity duration. Initially, the physical activity was planned to last for 60 minutes. Still, based on the feedback received, the duration was extended to 90 minutes, from 08:00 am to 09:30 am. This change in duration aims to ensure that the physical activity concludes at the same time as the break, allowing students to rest after engaging in relatively intense physical activity. This refinement is expected to enhance the effectiveness and comfort of students and maximize the benefits of physical activity in supporting the motor development of young children.

4. DISCUSSIONS

Physical activity for young children plays a crucial role in developing gross motor skills and body coordination. The explanation is supported by findings Magistro et al., (2022) that variation in physical activity is essential for accelerating children's motor development. This study

supports this theory by demonstrating that racket striking activities are more effective in increasing children's engagement than conventional physical activities such as gymnastics or walking. Gallotta et al., (2020) also explain that coordination activities, such as racket sports, can better stimulate motor development. These study findings confirm that variation in physical activities based on racket is essential for supporting the motor development of young children.

Safety in physical activity for young children is a crucial aspect when designing learning programs. Caldwell et al., (2020) also, the design of physical activities must consider children's physical abilities and ensure their safety while participating. This study aligns with this theory by ensuring that the racket-striking activity developed is tailored to the motor development levels of young children. One measure taken was using lighter rackets and appropriate sizes, enabling children to move freely without the risk of injury. Additionally, the physical activity must designed to minimize the potential for injury by considering safety aspects in equipment and execution (Bonaccorsi et al., 2020). This study confirms the importance of considering safety factors in every path of physical activities based on racket for young children, as it is key to supporting their optimal motor development.

The involvement of teachers in implementing physical activities in early childhood education is crucial for the success of the learning process. It is supported by Research f indings by Cheung (2020) states that trained teachers play a key role in effectively implementing physical activities, particularly in supporting the motor development of young children. The findings of this study indicate that to teach racket-striking activities, early childhood education teachers require specialized training to teach the correct techniques and effectively monitor students' safety and development. Training enhances teachers' skills in managing physical activities and provides an understanding of the importance of variation and safety in every activity (Maksymchuk et al., 2020). This study confirms that the success of implementing physical activities based on racket striking heavily relies on the readiness and skills of the teacher, which aligns with view on the necessity of training for early childhood education teachers to ensure effective and optimal learning. Teachers can also use the physical activities product document based on rackets as a reference source for developing physical activity learning tools for their students.

The validity and effectiveness of physical activities based on racket striking are crucial in ensuring that these activities can be optimally implemented in early childhood education. In the validation stage, Aiken's V value was obtained as 0.83, which means that the racket-based physical activities are valid. These findings align with previous research emphasizing the importance of product validation before its implementation in early childhood education contexts. In line with the views Esentürk (2021) that very is essential to ensure that the developed physical activity is genuinely suitable for the developmental needs of children, considering factors such as age, motor skill levels, and safety. Furthermore, this study also demonstrates the effectiveness of the activity in increasing student engagement in physical activities, as evidenced by the increased participation of children in racket-striking activities compared to traditional physical activities. Hu et al., (2022) also explain that the proper validation and practical implementation are vital to ensure that the physical activities provided genuinely support young children's motor and social development.

Implementing physical activities based on racket striking in the early childhood education curriculum in Yogyakarta faces several challenges that need to be addressed. value of the dependent t-test for student participation in physical activities based on racket striking for Early

Childhood Education students is 0.00, which is smaller than 0.05. This indicates a significant difference in student participation levels before and after implementing physical activities based on racket striking. This aligns with the findings of Indrawati (2022) who state that comparing pre- and post-implementation data, it helps determine the impact of the product on student engagement and development. This statistical analysis ensures that the product is contributing meaningfully to the educational outcomes and supports its validity for widespread use in educational settings. The study also identified that many early childhood education schools in Yogyakarta still rely on conventional physical activities, such as gymnastics, which offer limited variety in stimulating children's motor skills. Therefore, it is crucial to provide more comprehensive facilities that meet the developmental needs of young children, including lightweight rackets and safe areas for physical activities.

Another challenge lies in the role of teachers in implementing more innovative physical activities, as highlighted by Demchenko et al., (2021) who emphasize the importance of teacher training in teaching techniques that align with the developmental stages of children. Improving achievement in sports requires dedication, effort, and strategic planning and it's not something that happens overnight (Devi Catur Winata & Bastanta Mujirah P.A, 2021). This study shows that to implement racket-striking activities effectively, early childhood education teachers require specialized training to enhance their understanding of integrating space and exploration within physical activities. providing teachers with the necessary resources and support will enable them to create a more engaging and developmentally appropriate learning environment for young children. This challenge requires efforts to train educators to create enjoyable and educational learning experiences. Therefore, the quality of early childhood education education in Yogyakarta can be improved by enhancing facilities and providing better teacher training.

5. CONCLUSIONS

This study has demonstrated the significant benefits of developing innovative physical activities based on racket striking for early childhood education students in Yogyakarta. The research highlights the positive impact of these activities in enhancing children's gross motor skills, hand-eye coordination, and overall participation in physical activities. Through careful design, expert validation, and operational field testing, the racket-striking activities were found to be highly effective in engaging young children, surpassing traditional activities like gymnastics and walking. The results show a significant increase in student participation and indicate that these activities can be a valuable addition to early childhood education programs, fostering both physical and social development. The validation process, with a V Aiken value of 0.83, confirms the activities' relevance and suitability for young children, supporting the notion that diverse physical activities are essential for their motor development.

However, the implementation of racket-striking activities faces challenges, such as the need for specialized teacher training and the adaptation of facilities to meet the developmental needs of young children. Despite these challenges, the study underscores the importance of teacher involvement in the successful implementation of physical activities and the necessity of providing adequate resources for educators. The significant difference in student participation levels, as evidenced by the dependent t-test result of 0.00 (smaller than 0.05), further emphasizes the effectiveness of racket-striking activities in improving engagement and motor skill development. This statistical result indicates that the activities had a notable impact on student

participation, making them a valuable alternative to conventional physical activities. By offering practical guidelines and engaging activities, this study contributes to the development of early childhood education curricula that go beyond traditional methods, promoting a more holistic approach to children's physical and motor skills development. The research encourages further exploration and refinement of physical activity programs in early childhood education to ensure a diverse, effective, and safe learning environment.

Acknowledgment

We would like to express our heartfelt gratitude to TK Pembina Yogyakarta, TK Negeri 2 Yogyakarta, TK Negeri 4 Yogyakarta, and TK Negeri 11 Yogyakarta, as well as all relevant parties, for their invaluable support throughout this research. Their willingness to serve as both research sites and subjects has played a crucial role in the success of this study. We sincerely hope that the findings and insights from this research will contribute meaningfully to the advancement of physical activities in early childhood education in Yogyakarta. Our deepest thanks also go to Lembaga Pengelola Dana Pendidikan (LPDP) for their generous support of this research, which has been instrumental in enabling the successful completion of this study.

REFERENCES

Biino, V., Tinagli, V., Borioni, F., & Pesce, C. (2023). Cognitively enriched physical activity may foster motor competence and executive function as early as preschool age: a pilot trial. *Physical Education and Sport Pedagogy*, *28*(4), 425–443. https://doi.org/10.1080/17408989.2021.1990249

Bonaccorsi, G., Manzi, F., Del Riccio, M., Setola, N., Naldi, E., Milani, C., Giorgetti, D., Dellisanti, C., & Lorini, C. (2020). Impact of the built environment and the neighborhood in promoting the physical activity and the healthy aging in older people: An umbrella review. *International Journal of Environmental Research and Public Health*, *17*(17), 6127. https://doi.org/10.3390/ijerph17176127

Borg, W. R., & Gall, M. D. (2003). *Educational Research: An Introduction 4th Edition* (4th ed.). Longman Inc.

Caldwell, H. A. T., Di Cristofaro, N. A., Cairney, J., Bray, S. R., MacDonald, M. J., & Timmons, B. W. (2020). Physical literacy, physical activity, and health indicators in school-age children. *International Journal of Environmental Research and Public Health*, *17*(15), 5367. https://doi.org/10.3390/ijerph17155367

Cheung, P. (2020). Teachers as role models for physical activity: Are preschool children more active when their teachers are active? *European Physical Education Review*, *26*(1), 101–110. https://doi.org/10.1177/1356336X19835240

Dapp, L. C., Gashaj, V., & Roebers, C. M. (2021). Physical activity and motor skills in children: A differentiated approach. *Psychology of Sport and Exercise*, *54*, 101916. https://doi.org/10.1016/j.psychsport.2021.101916

Demchenko, I., Maksymchuk, B., Bilan, V., Maksymchuk, I., & Kalynovska, I. (2021). Training future physical education teachers for professional activities under the conditions of

inclusive education. *Brain. Broad Research In Artificial Intelligence And Neuroscience*, *12*(3), 191–213. https://doi.org/10.18662/brain/12.3/227

Devi Catur Winata, & Bastanta Mujirah P.A. (2021). Survey of physical fitness levels of badminton athletes in Binjai City, Indonesia. *JUMORA: Jurnal Moderasi Olahraga*, *1*(02), 84–94. https://doi.org/10.53863/mor.v1i02.228

Duncan, M. J., Noon, M., Lawson, C., Hurst, J., & Eyre, E. L. J. (2020). The effectiveness of a primary school based badminton intervention on children's fundamental movement skills. *Sports*, *8*(2), 11. https://doi.org/10.3390/sports8020011

Esentürk, O. K. (2021). Parents' perceptions on physical activity for their children with autism spectrum disorders during the novel Coronavirus outbreak. *International Journal of Developmental Disabilities*, *67*(6), 446–457. https://doi.org/10.1080/20473869.2020.1769333

Gallotta, M. C., Bonavolontà, V., Zimatore, G., Iazzoni, S., Guidetti, L., & Baldari, C. (2020). Effects of open (racket) and closed (running) skill sports practice on children's attentional performance. *The Open Sports Sciences Journal*, *13*(1), 105–113. https://doi.org/10.2174/1875399X02013010105

Hu, B. Y., Wu, Z., & Kong, Z. (2022). Family physical activities choice, parental views of physical activities, and chinese preschool children's physical fitness and motor development. *Early Childhood Education Journal*, *50*(5), 841–853. https://doi.org/10.1007/s10643-021-01190-5

Indrawati, R. (2022). Penerapan metode pemberian tugas terhadap kemampuan mengenal bilangan pada anak usia dini. *PAUD Lectura: Jurnal Pendidikan Anak Usia Dini*, *5*(02), 45–52. https://doi.org/10.31849/paud-lectura.v5i02.8736

Irawan, F. A., Sutaryono, S., Permana, D. F. W., Chuang, L.-R., & Yuwono, Y. (2021). Locomotor skills: Traditional games in the fundamental of physical activities. *Al-Athfaal: Jurnal Ilmiah Pendidikan Anak Usia Dini*, *4*(1), 1–13. https://doi.org/10.24042/ajipaud.v4i1.8215

Johor, Z., Candra, R., Rasyid, W., Asnaldi, A., Oktarifaldi, & Bakhtiar, S. (2020). Effect of hand-eye coordination on the capability of children object control. *Proceedings of the 1st International Conference of Physical Education (ICPE 2019)*. https://doi.org/10.2991/assehr.k.200805.056

Juniarti, Y. (2019). Pengembangan media ludo geometri (DORI) pada fisik motorik anak usia dini. *Al-Athfal : Jurnal Pendidikan Anak*, *5*(2), 169–182. https://doi.org/10.14421/al-athfal.2019.52-04

Kellstedt, D. K., Schenkelberg, M. A., Essay, A. M., Von Seggern, M. J., Rosenkranz, R. R., Welk, G. J., High, R., & Dzewaltowski, D. A. (2021). Youth sport participation and physical activity in rural communities. *Archives of Public Health*, *79*(1), 46. https://doi.org/10.1186/s13690-021-00570-y

Ku, B. (2020). Motor skill interventions on motor skills in children with developmental disabilities: A Literature review. *The Asian Journal of Kinesiology*, *22*(4), 11–22. https://doi.org/10.15758/ajk.2020.22.4.11

Magistro, D., Cooper, S. B., Carlevaro, F., Marchetti, I., Magno, F., Bardaglio, G., & Musella, G. (2022). Two years of physically active mathematics lessons enhance cognitive function and gross motor skills in primary school children. *Psychology of Sport and Exercise*, *63*, 102254. https://doi.org/10.1016/j.psychsport.2022.102254

Maksymchuk, B., Gurevych, R., Matviichuk, T., Surovov, O., Stepanchenko, N., Opushko, N., Sitovskyi, A., Kosynskyi, E., Bogdanyuk, A., Vakoliuk, A., Solovyov, V., & Maksymchuk, I. (2020). Training future teachers to organize school sport. *Revista Romaneasca Pentru Educatie Multidimensionala*, *12*(4), 310–327. https://doi.org/10.18662/rrem/12.4/347

Morales-Campo, P. T., Pérez-Muñoz, S., López-García, S., Díez-Fernández, P., & Rodríguez-Cayetano, A. (2025). New alternative proposal in physical education: Touchtennis as a racket sport in schools. *Frontiers in Sports and Active Living*, *7*. https://doi.org/10.3389/fspor.2025.1545994

Nor Azmi, A. M., Fook Lee, J. L., Md Nadzalan, A., Mohd Nasir, M. Z., & Aizzat Adnan, M. (2024). Effect of scaling racquet using a body-scaling approach on badminton match performance. *Sport Mont*, *22*(1), 93–98. https://doi.org/10.26773/smj.240213

Rahman, M. N. A. A., Shariff, A. R. M., & Hizan, H. M. (2024). Exploring pathways: Constraints, initiatives, and alternatives for introducing tennis in primary education. *Jurnal Sains Sukan Dan Pendidikan Jasmani*, *13*(1), 68–74.

Rizki, H., & Aguss, R. M. (2020). Analisis tingkat pencapaian perkembangan motorik kasar anak usia 4-5 tahun pada masa pandemi covid-19. *Journal Of Physical Education*, *1*(2), 20–24. https://doi.org/10.33365/joupe.v1i2.588

Rojas-Valverde, D., Rico-González, M., Giménez-Egido, J. M., & Pino-Ortega, J. (2021). Physical fitness and conditioning in badminton school matches: a comparison between modalities and sexes. *International Journal of Performance Analysis in Sport*, *21*(1), 51–60. https://doi.org/10.1080/24748668.2020.1845535

Sääkslahti, A., & Niemistö, D. (2021). Outdoor activities and motor development in 2–7 year old boys and girls . *Journal of Physical Education and Sport*, *21*(1), 463–468.

Shahidi, S. H., Stewart Williams, J., & Hassani, F. (2020). Physical activity during COVID-19 quarantine. *Acta Paediatrica*, *109*(10), 2147–2148. https://doi.org/10.1111/apa.15420

Sutapa, P., Pratama, K. W., Rosly, M. M., Ali, S. K. S., & Karakauki, M. (2021). Motor skills in early childhood through goal-oriented play activity. *Children*, *8*(11), 994. https://doi.org/10.3390/children8110994

Tandon, P., Hassairi, N., Soderberg, J., & Joseph, G. (2020). The relationship of gross motor and physical activity environments in child care settings with early learning outcomes. *Early Child Development and Care*, *190*(4), 570–579. https://doi.org/10.1080/03004430.2018.1485670

Touzard, P., Lecomte, C., Bideau, B., Kulpa, R., Fourel, L., Fadier, M., Cantin, N., & Martin, C. (2023). There is no rush to upgrade the tennis racket in young intermediate competitive players: The effects of scaling racket on serve biomechanics and performance. *Frontiers in Psychology*, *14*. https://doi.org/10.3389/fpsyg.2023.1104146