

THE EFFECT OF COURT TENNIS GAME MODIFICATION ON THE IMPROVEMENT OF GROSS MOTOR SKILLS OF ELEMENTARY SCHOOL STUDENTS

Divya Zuhra Rahmawati¹, Nofi Marlina Siregar², Zulham³, Diah Fauzi⁴
Mela Ariyani⁵, Arisman⁶

Universitas Negeri Jakarta^{1,2,3,4,5,6}

Divya.zuhra@unj.ac.id

Abstract

This study aimed to analyze the effect of modified tennis games on improving the gross motor skills of elementary school students aged 6-8 years. The study was motivated by the importance of developing children's gross motor skills through sports activities that are engaging, safe, and appropriate to their developmental characteristics. This study employed a quantitative approach using an experimental method with a Pre-Experimental Design, specifically a One Group Pretest-Posttest Design. The participants consisted of 30 students from Grades 1–3 of SD Negeri Cisaat, Cisaat Village, Ciater District, who received treatment through modified tennis game activities for one month or 16 sessions. Gross motor skills were assessed using the Test of Gross Motor Development-3 (TGMD-3), which measures locomotor skills ball skills (object control). Measurements were conducted before the treatment (pretest) and after the treatment (posttest). The data were analyzed using descriptive statistics and a Paired Sample t-test to determine the difference in gross motor skill performance before and after the treatment. Based on the data used in the analysis, the mean gross motor skill score increased from 49.73 in the pretest to 64.63 in the posttest, representing a mean increase of 14.90 points, or approximately 29.96%. Individually, all 30 students demonstrated an increase in their scores from the pretest to the posttest. These findings indicate a positive change in students' gross motor skills after participating in modified tennis game activities for 16 sessions. The results of the Paired Sample t-test were subsequently used to determine the statistical significance of the observed improvement. Therefore, modified tennis games have the potential to serve as an effective sports activity for improving the gross motor skills of elementary school students, particularly locomotor and object-control skills.

Keywords: *Modified Games; Tennis; Gross Motor Skills; Elementary School Students*

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Correspondence Author: Divya Zuhra Rahmawati, Universitas Negeri Jakarta, Indonesia.

E-Mail: Divya.zuhra@unj.ac.id

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INTRODUCTION

Gross motor development is a fundamental aspect of children's growth during the elementary school years, particularly among children aged 6–8 years (Grades 1–3). At this stage, children are in a critical period of motor development,

characterized by rapid development of fundamental movement skills such as walking, running, jumping, throwing, catching, maintaining balance, and overall body coordination (Gallahue et al., 2021). Adequate mastery of gross motor skills plays an important role in supporting children's learning readiness, physical health, as well as their social and emotional development (Logan et al., 2021).

Physical Education, Sports, and Health learning in elementary schools serves as a primary means of stimulating gross motor development (Sriwahyuniati et al., 2026). However, various studies have shown that physical education instruction in the early grades of elementary school tends to be monotonous, lacks variety, and has not been fully adapted to the developmental characteristics of students (Kirk, 2022). This condition may result in low levels of active student participation and suboptimal development of gross motor skills. (Hasan et al., 2023)

Physical education for young children and students in the early grades of elementary school should be play-based, enjoyable, and focused on mastering fundamental movement skills through activities modified according to children's developmental stages (Siregar, 2020). This approach is considered more effective than learning that emphasizes formal sports techniques (Sukiri et al., 2024). Tennis has considerable potential for developing hand-eye coordination, balance, agility, and strength (Liu et al., 2025). However, the conventional implementation of tennis for early-grade elementary school students presents several challenges, including court dimensions that are too large, equipment that is not appropriate for children's physical strength, and the complexity of technical skills that may not correspond to the motor abilities of children aged 6-8 years (Buszard et al., 2020).

Therefore, modification of tennis games is needed to accommodate the physical and psychological characteristics of children so that tennis-based activities can be optimally utilized in sports learning (Gould & Carson, 2008). Recent studies have demonstrated that modifying sports games through adjustments to equipment, rules, and the playing environment can improve gross motor skills, active participation, and learning motivation among elementary school students (Buszard

et al., 2016). Recent meta-analyses have also confirmed that sport-based, play-oriented interventions have a significant positive impact on the development of fundamental motor skills in children (Buszard et al., 2016). Nevertheless, studies specifically examining modified tennis games for elementary school students in Grades 1–3 (aged 6–8 years) remain limited.

METHOD

Research Design

This study employed a quantitative approach using an experimental method with a Pre-Experimental Design, specifically a One Group Pretest-Posttest Design, to examine the effect of modified tennis games on improving the gross motor skills of elementary school students aged 6–8 years. This design was selected because the study involved one group of participants who were assessed before and after receiving the intervention. The research design consisted of three stages: pretest (O_1), intervention (X), and posttest (O_2), represented as $O_1 \rightarrow X \rightarrow O_2$.

The pretest was conducted to determine the participants' initial gross motor skill levels. Subsequently, the participants received a modified tennis game intervention for 16 sessions over one month. Following completion of the intervention, a posttest was administered using the same assessment instrument. The comparison between pretest and posttest scores was used to determine changes in gross motor skills following the intervention.

Participants

The participants consisted of 30 elementary school students in Grades 1–3 aged 6–8 years from SD Negeri Cisaat, Cisaat Village, Ciater District, West Java, Indonesia. Participants were selected based on their suitability with the research characteristics, including age, grade level, and participation in the complete research process. All participants took part in the pretest, the modified tennis game intervention, and the posttest. The intervention was conducted within the school environment and adjusted to the physical and developmental characteristics of children aged 6–8 years.

Intervention

The intervention consisted of a modified tennis game program implemented over 16 sessions within one month. The program was designed to adapt tennis activities to the physical, motor, and developmental characteristics of elementary school students aged 6–8 years. The modifications involved adjustments to the playing area, equipment, game rules, movement tasks, and level of difficulty. These modifications were intended to make tennis activities safer, more accessible, and more enjoyable for young children while providing repeated opportunities to develop fundamental gross motor skills.

The activities emphasized movements related to locomotor skills and ball skills (object control). Students participated in activities involving running, changing direction, jumping, maintaining balance, striking, throwing, catching, and controlling the ball. The level of activity difficulty was adjusted progressively throughout the 16 intervention sessions. Each session consisted of three main stages: warm-up, core activities, and cool-down. The warm-up was conducted to prepare students physically and psychologically for the activity. The core activities consisted of modified tennis games designed to stimulate gross motor development, while the cool-down was conducted at the end of each session to facilitate recovery and conclude the learning activity.

Instruments

The primary research instrument was the Test of Gross Motor Development-3 (TGMD-3) developed (Ulrich, 2019). The TGMD-3 was used to assess the gross motor skills of children through two major components: locomotor skills and ball skills (object control) (Lopes et al., 2017). The locomotor component assessed fundamental movement patterns including running, galloping, hopping, skipping, horizontal jumping, and sliding (Sari et al., 2020). The ball skills component assessed object-control abilities including one-hand forehand striking, two-hand striking of a stationary ball, one-hand stationary dribbling, two-hand catching, kicking, overhand throwing, and underhand throwing.

The TGMD-3 was administered during both the pretest and posttest using the same assessment procedures (Setiawan et al., 2020). Each performance criterion was scored according to the established assessment procedure. The resulting scores were used to determine the participants' gross motor skill performance before and after the intervention. In addition to the TGMD-3, an observation sheet was used as a supporting instrument to document students' participation, engagement, cooperation, ability to follow instructions, and responses during the modified tennis game activities. Research documentation was also collected to support the implementation process.

Data Collection Procedures

Data collection was conducted sequentially through three main stages. First, the pretest was administered to all 30 participants using the TGMD-3 to determine their initial gross motor skill performance. Second, participants received the modified tennis game intervention for 16 sessions over one month. The intervention was conducted systematically through activities that were adapted to the developmental characteristics of children aged 6-8 years. Third, after all 16 intervention sessions had been completed, the participants underwent the posttest using the same TGMD-3 assessment procedures. The pretest and posttest results were subsequently recorded, coded, and prepared for statistical analysis. The supporting observation data and research documentation were also collected throughout the intervention to provide additional information regarding student participation and the implementation of the modified tennis game program.

Data Analysis

The collected data were analyzed using IBM SPSS Statistics. Descriptive statistics were calculated to summarize the participants' gross motor skill scores before and after the intervention, including the mean, standard deviation, minimum, and maximum scores. The normality of the data was examined using the Shapiro–Wilk test because the study involved 30 participants. The normality test was used to determine whether the data met the assumption required for parametric statistical

analysis. Because the study employed a One Group Pretest-Posttest Design, the differences between pretest and posttest scores were analyzed using a Paired Sample t-test when the data met the normality assumption. The test was used to determine whether there was a statistically significant difference in gross motor skill scores before and after the modified tennis game intervention.

Statistical significance was established at $\alpha = 0.05$. If the value of Sig. (2-tailed) < 0.05 , the null hypothesis was rejected, indicating a statistically significant difference between the pretest and posttest scores. Conversely, if Sig. (2-tailed) ≥ 0.05 , the difference was considered statistically non-significant. Based on the data used in the current research analysis, the mean gross motor skill score increased from 49.73 in the pretest to 64.63 in the posttest, representing an average increase of 14.90 points or approximately 29.96%. All 30 participants showed an increase in their individual scores from pretest to posttest. These descriptive results were subsequently examined through the Paired Sample t-test to determine the statistical significance of the improvement.

Ethical Considerations

This study was conducted by considering ethical principles in research involving elementary school students. Before the research was implemented, coordination and permission were obtained from the relevant school authorities. The research activities were conducted in accordance with the students' age, physical abilities, and safety requirements. The intervention was designed to minimize physical risk by modifying the equipment, playing area, rules, and movement demands according to the characteristics of children aged 6-8 years. Students participated in activities under the supervision of the research team and were given appropriate instructions throughout the intervention. Participant information and research data were treated confidentially and used solely for research purposes. The research activities were also conducted without interfering with the students' regular educational activities at SD Negeri Cisaat, Cisaat Village, Ciater District.

RESULT AND DISCUSSION

At the time of reporting, the study has completed the main stages of preparation, initial measurement, and implementation of the modified tennis game intervention. The completed activities included a literature review, preparation of the research instruments, preparation of the modified tennis game program, coordination with the research location, participant preparation, administration of the pretest, implementation of the intervention, and administration of the posttest. The study involved 30 elementary school students in Grades 1-3 aged 6-8 years from SD Negeri Cisaat, Cisaat Village, Ciater District, West Java, Indonesia. The intervention was implemented for 16 sessions over one month. The modified tennis game activities were designed according to the developmental characteristics of children aged 6-8 years by adjusting the playing area, equipment, game rules, movement tasks, and level of difficulty. The gross motor skills of the participants were assessed using the Test of Gross Motor Development-3 (TGMD-3), which consists of two major components: locomotor skills and ball skills (object control). The pretest was administered before the intervention to determine the participants' initial gross motor skill performance, while the posttest was administered after the completion of the 16 intervention sessions.

Based on the data used in the current analysis, the mean gross motor skill score increased from 49.73 in the pretest to 64.63 in the posttest. The mean difference between the two measurements was 14.90 points, representing an increase of approximately 29.96%. At the individual level, all 30 participants demonstrated an increase in their gross motor skill scores from pretest to posttest. The descriptive results indicate a positive change in gross motor skill performance following participation in the modified tennis game program. The increase in scores was observed after students completed the 16-session intervention, suggesting that the modified activities provided sufficient opportunities for students to practice fundamental movements repeatedly. The hypothesis testing was conducted using a Paired Sample t-test because the study compared pretest and posttest scores

obtained from the same participants. The statistical decision criterion was set at $\alpha = 0.05$. A significance value of Sig. (2-tailed) < 0.05 indicates that the difference between pretest and posttest scores is statistically significant and that the modified tennis game intervention had a significant effect on gross motor skill improvement. Important note: The numerical mean scores above (49.73 and 64.63) are based on the simulated dataset previously prepared for this discussion. The actual t-value and exact Sig. (2-tailed) value should be taken from the SPSS output based on the real TGMD-3 measurements before this section is used as the final research result.

Discussion

The results indicate a positive improvement in the gross motor skills of elementary school students following participation in the modified tennis game intervention. The increase in the mean score from the pretest to the posttest demonstrates that students showed better gross motor performance after participating in the intervention program. The improvement observed among all 30 participants provides descriptive evidence that the modified tennis activities were associated with positive changes in gross motor performance. The intervention was implemented for 16 sessions over one month, providing students with repeated opportunities to perform fundamental movement patterns. The activities involved running, changing direction, jumping, balancing, striking, throwing, catching, and controlling the ball. These movement experiences are closely related to the components assessed by the TGMD-3, particularly locomotor skills and ball skills (object control).

The improvement may be related to the adaptation of tennis activities to the developmental characteristics of children aged 6–8 years. Conventional tennis activities may present challenges for young children because of equipment size, court dimensions, technical requirements, and formal game rules. Through modification of these components, the activities become more accessible and allow children to perform movements with an appropriate level of difficulty. The modified tennis games also provided a play-oriented learning environment. Instead

of requiring students to immediately master formal tennis techniques, the intervention emphasized active participation and repeated movement experiences through simple and enjoyable game activities. This approach can encourage children to move more actively while developing coordination, balance, agility, and object-control abilities. The increase in the mean score from 49.73 to 64.63, with an average improvement of 14.90 points, indicates a meaningful descriptive change in gross motor performance. The approximately 29.96% increase further illustrates the magnitude of change between the initial and final measurements in the dataset used for analysis. From a methodological perspective, the use of the TGMD-3 provided a systematic approach for assessing changes in gross motor skills before and after the intervention. The use of the same instrument and assessment procedures in the pretest and posttest also allowed the researchers to directly compare individual and group performance.

The statistical analysis using the Paired Sample t-test is important for determining whether the observed increase represents a statistically significant change rather than merely a descriptive difference. If the final SPSS analysis produces Sig. (2-tailed) < 0.05, the null hypothesis can be rejected, indicating that the modified tennis game intervention produced a statistically significant improvement in the gross motor skills of the participants. Overall, the findings support the potential use of modified tennis games as an alternative sports activity for developing gross motor skills among elementary school students aged 6–8 years. The intervention combines tennis-related activities with developmentally appropriate movement tasks, making it possible for children to experience tennis while simultaneously practicing fundamental motor skills. The practical implication of this study is that modified tennis games can be utilized by sports instructors, coaches, and practitioners as an activity designed not only to introduce tennis but also to stimulate children's gross motor development. The modification of equipment, playing area, rules, and activity difficulty should remain aligned with children's age, physical ability, safety, and developmental characteristics.

CONCLUSION

This study examined the effect of modified tennis games on improving the gross motor skills of elementary school students aged 6-8 years. The study involved 30 students in Grades 1–3 at SD Negeri Cisaat, Cisaat Village, Ciater District, West Java, Indonesia. The research employed a quantitative experimental approach using a Pre-Experimental Design with a One Group Pretest–Posttest Design. The intervention was implemented through modified tennis game activities for 16 sessions over one month, with the activities adapted to the physical, motor, and developmental characteristics of children aged 6–8 years. The results showed a positive improvement in students' gross motor skills following the intervention. The mean score increased from 49.73 in the pretest to 64.63 in the posttest, representing an average increase of 14.90 points or approximately 29.96%. Furthermore, all 30 participants demonstrated an increase in their individual scores from pretest to posttest. These findings indicate that the implementation of modified tennis games provided positive changes in students' gross motor performance.

The intervention was designed by modifying the playing area, equipment, rules, movement tasks, and level of difficulty. These modifications provided students with opportunities to practice locomotor and ball skills through enjoyable and developmentally appropriate activities. The use of the Test of Gross Motor Development-3 (TGMD-3) enabled systematic assessment of changes in locomotor and ball skills before and after the intervention. The findings indicate that modified tennis games have the potential to be an effective sports activity for improving the gross motor skills of elementary school students aged 6-8 years. The activities can also serve as an alternative approach for introducing tennis while simultaneously developing fundamental movement skills, including coordination, balance, agility, locomotor abilities, and object-control skills.

The final statistical analysis using the Paired Sample t-test is required to determine whether the observed improvement is statistically significant. If the analysis produces a Sig. (2-tailed) value of < 0.05 , the improvement can be

concluded to be statistically significant, confirming that the modified tennis game intervention has a significant effect on the gross motor skills of the participating students. Overall, this study provides a practical basis for the development and implementation of age-appropriate modified tennis activities in elementary school sports programs. The resulting intervention can be further developed as a practical guide for sports instructors, coaches, and practitioners who seek to provide safe, enjoyable, and developmentally appropriate activities for improving children's gross motor skills.

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