The impact of physical activity-based freedom of movement on social-emotional development in kindergarten

El impacto de la libertad de movimiento basada en la actividad física en el desarrollo socioemocional en el jardín de infancia

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Abstract

Introduction: Social-emotional development is a crucial aspect in early childhood education. This study explores the impact of physical activity-based freedom of movement on social-emotional development in kindergarten.
Methodology: A quasi-experimental pretest-posttest design was used, with two groups: a treatment group (n=65) and a control group (n=66) from four public kindergartens in Yogyakarta. The treatment group participated in a physical activity-based freedom of movement program, while the control group followed a conventional curriculum. Social-emotional development was measured using a validated tool, and data analysis included dependent samples t-tests for within-group comparisons and independent samples t-tests for differences between the groups.
Results: Significant improvements were observed in both groups. The dependent samples t-test for the treatment group showed t = 25.482, p = 0.001; for the control group, t = 14.703, p = 0.001. The independent samples t-test for post-assessment revealed t = 6.514, p = 0.001, indicating a significant difference between the treatment and control groups, with the treatment group showing greater improvement.
Conclusions: Physical activity-based freedom of movement significantly enhances social-emotional development in young children, making it an effective pedagogical strategy in early childhood education.

Keywords

Physical activity, freedom of movement, social-emotional, kindergarten.

Resumen

Introducción: El desarrollo socioemocional es un aspecto crucial en la educación infantil. Este estudio explora el impacto de la libertad de movimiento basada en la actividad física en el desarrollo socioemocional en el jardín de infancia.
Metodología: Se utilizó un diseño cuasi-experimental de pretest-posttest, con dos grupos: un grupo experimental (n=65) y un grupo de control (n=66) de cuatro jardines de infancia públicos en Yogyakarta. El grupo experimental participó en un programa basado en la actividad física que promovía la libertad de movimiento, mientras que el grupo de control siguió un currículo convencional. El desarrollo socioemocional se midió utilizando una herramienta validada, y el análisis de datos incluyó pruebas t para muestras dependientes para las comparaciones dentro del grupo y pruebas t para muestras independientes para las diferencias entre los grupos.
Resultados: Se observaron mejoras significativas en ambos grupos. La prueba t para muestras dependientes del grupo experimental mostró t = 25.482, p = 0.001; para el grupo de control, t = 14.703, p = 0.001. La prueba t para muestras independientes en la evaluación posterior reveló t = 6.514, p = 0.001, lo que indica una diferencia significativa entre el grupo experimental y el grupo de control, siendo el grupo experimental el que mostró una mayor mejora.
Conclusiones: La libertad de movimiento basada en la actividad física mejora significativamente el desarrollo socioemocional en los niños pequeños, lo que la convierte en una estrategia pedagógica efectiva en la educación infantil.

Palabras clave

Actividad física, libertad de movimiento, desarrollo socioemocional, jardín de infancia.

Introduction

Young children's social-emotional development is a fundamental aspect determining their readiness to learn and interact within the kindergarten environment. The social-emotional aspect encompasses the child's ability to recognise and manage emotions, build positive social relationships, and develop empathy and Independence (Harrington et al., 2020; Thi Nho & Thi Thiep, 2024;). Children with strong social-emotional skills are better equipped to adapt to academic and social demands, enhancing their long-term educational success (Aksoy & Gresham, 2024; Rademacher et al., 2022; Walker & Rinaldi, 2020). The ability to manage emotions from an early age has been shown to contribute to behavioural regulation and academic achievement (Wesarg et al., 2020). Given the importance of social-emotional aspects in children, early childhood education should not solely focus on cognitive development but also emphasize strengthening social-emotional foundations as a cornerstone of holistic development.

Numerous studies have shown that physical activity positively influences young children's social and emotional development. Physical activity supports physical health and enhances social skills through peer interactions and emotional regulation (Crumbley et al., 2020; Wang, 2022;). Participation in active body movement games has been proven to improve cooperation, self-regulation, and empathy, which are crucial for a child's readiness to enter formal education (Savina, 2024; Wood et al., 2020). Children's involvement in motor activities is closely linked to the development of social competence and a reduction in behavioural problems (Hill et al., 2024; ; Herrmann et al., 2021; Salaj & Masnjak, 2022). These findings emphasise that freedom of movement in physical activities encourages children to develop independence and self-confidence when facing social challenges. Therefore, physical activity is essential in stimulating balanced social-emotional development in early childhood.

Physical activity-based freedom of movement is an early childhood learning approach that emphasises the freedom to move within structured physical activities, allowing children to learn through play, interact, and develop their potential holistically. According to Hidayat et al. (2024) Physical activity-based freedom of movement will enable children to explore movement safely and in alignment with their developmental stage, supporting integrated physical, cognitive, social, and emotional growth. The free movement experiences facilitated by teachers can enhance self-regulation and social competence in young children (Ebrahimzadeh, 2023; Jang & Hong, 2022; Wu et al., 2024;). Freedom of movement in early childhood education has been shown to foster creativity, self-confidence, and Independence (Treewong, 2022; Zarotis, 2020). Therefore, physical activity-based freedom of movement can serve as an effective pedagogical strategy in creating holistic learning that aligns with the developmental needs of young children.

In kindergarten, excessive restrictions on movement can reduce children's opportunities to develop essential social skills, such as sharing, cooperating, and resolving conflicts. Overly limited physical activity deprives children of learning experiences that naturally arise through social interactions (Bjorklund, 2022;Digennaro, 2021; Jago et al., 2023). Children with more opportunities for free movement tend to demonstrate higher levels of empathy and cooperation skills than those with highly restricted activities (Coelho et al., 2024; Kuzik et al., 2020). Engaging in active play provides children with the space to learn how to manage emotions and resolve differences constructively Drakopoulou & Kampeza, 2024; Ningsi et al., 2025). Creating a learning environment that allows freedom of movement is crucial in supporting the optimal social-emotional development of children.

Kindergarten teachers play a central role in designing physical activities that allow children to move while ensuring safety and direction. The teacher's role extends beyond being a learning facilitator to include managing an environment that supports movement exploration in line with the child's developmental stage (Agard et al., 2021; Cheung et al., 2023;). The quality of teacher interaction when designing physical activities significantly enhances children's social-emotional skills, including cooperation and self-regulation (Martínez-Bello et al., 2025; Smidt & Embacher, 2020). Teachers who can provide physical activity can help children develop self-confidence, creativity, and problem-solving skills (Aguilar, 2024; Azzam et al., 2025; ; Vazou & Mavilidi, 2021). The teacher's ability to design structured and meaningful physical activities is crucial to ensure children receive a holistic learning experience.

Previous research has extensively shown a strong link between physical activity and enhancing social and emotional skills in young children. Physical activity supports the development of emotional regulation, cooperation, and healthy social interactions within the school environment (Kliziene et al., 2021;

Moreira et al., 2023;). According to Gilang et al. (2024) Children's active play involvement improves empathy, sharing abilities, and conflict resolution skills. Motor activities have been proven to build children's self-confidence and Independence (Apriyani et al., 2025; Dewi & Tutuandari, 2025; Ramdini & Yaswinda, 2021). However, studies specifically focusing on the approach of physical activity-based freedom of movement in early childhood education remain limited. This highlights a research gap that needs to be addressed to broaden the understanding of the effectiveness of this approach in fostering children's social-emotional development.

Based on the analysis of various theories and findings presented in the previous paragraph, it is clear and compelling that research into the impact of physical activity-based freedom of movement on social-emotional development in kindergarten is crucial, both for scientific contribution and practical recommendations for teachers and schools. This study can expand academic understanding of how free movement experiences influence young children's social-emotional skills. The findings in the field of education have the potential to serve as a reference for teachers in designing learning strategies in schools (Martinez, 2022). Educational institutions can also use these findings to develop curriculum policies that emphasise a more holistic approach. Therefore, this research is expected to bridge the gap between theory and practice, while making a tangible contribution to improving the quality of early childhood education, particularly in relation to physical activity and social-emotional development.

Method

This study adopts a quasi-experimental research design, which involves both a treatment group and a control group. The primary objective of this research is to examine the impact of physical activity-based freedom of movement on the social-emotional development of kindergarten children. A quasi-experimental design is particularly suitable in educational settings where random assignment of participants is often unfeasible, yet it still allows for valid and reliable comparisons between groups (Bunselmeyer & Schulz, 2020). One key advantage of this design is its capacity to assess the effectiveness of interventions in real-world educational environments, providing insights into how such programmes can be implemented practically. In this study, the treatment group consisted of children who participated in a structured programme that encouraged physical activity and freedom of movement, designed to enhance social-emotional skills. The control group, on the other hand, followed the conventional curriculum without incorporating the movement-based activities. By comparing the outcomes between these two groups, the study seeks to determine whether the physical activity-based intervention offers a measurable improvement in children's social-emotional development.

Participants

The participants in this study consisted of young children enrolled in four public kindergartens in Yogyakarta: TK Negeri Pembina Yogyakarta, TK Negeri 2 Yogyakarta, TK Negeri 4 Yogyakarta, and TK Negeri 11 Yogyakarta. Participants were selected purposively to ensure alignment with the research objectives, considering the homogeneous developmental age range of children within the kindergarten age group. According to Nyimbili & Nyimbili (2024) purposive sampling is commonly used in educational research as it allows researchers to select subjects most relevant to the study's variables. In this study, the participants were divided into two groups: the treatment group, consisting of 65 students, and the control group, composed of 66 students. The treatment group received the physical activity-based freedom of movement programme. In contrast, the control group did not receive this programme and instead participated in conventional learning according to the existing curriculum.

Table 1. Description of the number of research participants by group and gender

School	Treatment Group			Control Group		
	Male	Female	Total	Male	Female	Total
TK Negeri Pembina Yogyakarta	7	9	16	6	10	16
TK Negeri 2 Yogyakarta	5	11	16	8	9	17
TK Negeri 4 Yogyakarta	6	10	16	7	10	17
TK Negeri 11 Yogyakarta	8	9	17	8	8	16
Total			65			66

Based on the demographic background of the parents' education, a comparison can be made between the education levels of the parents of students in the treatment group and the control group. Below is an overview of the demographic education levels of the parents of the students who participated in this study.

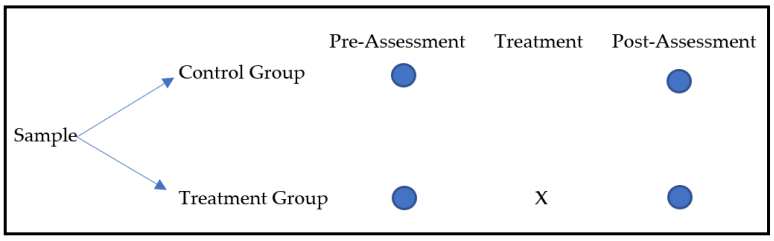
Table 2. Description of the parents' educational background

Demographics	Treatment Group		Control Group	
	N	Percentages (%)	N	Percentages (%)
Father's education level				
Post or graduated	12	18,46 %	16	24,24 %
High school level	39	60,00 %	34	51,52 %
Middle school level	8	12,31 %	12	18,18 %
Primary school level	4	6,15 %	3	4,55 %
Uneducated	2	3,08 %	1	1,52 %
Mother's education level				
Post or graduated	9	13,85 %	7	10,61 %
High school level	44	67,69 %	49	74,24 %
Middle school level	5	7,69 %	6	9,09 %
Primary school level	3	4,62 %	2	3,03 %
Uneducated	4	6,15 %	2	3,03 %

Procedure

Physical activity: This study uses a quasi-experimental design with a pre-test post-test control group approach, which allows for a comparison to test the effectiveness of the intervention in the treatment group against the control group. A quasi-experimental design was selected for this research because it aligns with educational research characteristics, where complete randomisation is often challenging to implement. Yet, it still provides adequate internal validity (Miller et al., 2020). Through this design, the researcher can measure changes in children's social-emotional development before and after implementing the physical activity-based freedom of movement programme, ensuring that the results are more objective. Using quasi-experimental designs is also widely recommended in educational studies as it allows assessing intervention impacts in real-world school settings.

Figure 1. Quasi-Experimental Research Diagram in this Study



Measurements

Measurements in this study were conducted through direct observation, teacher questionnaires, and a validated social-emotional development assessment instrument. Observation recorded children's behaviours during physical activities, including social interactions and emotional regulation in the classroom and during play. Additionally, teachers and the research team collaborated to complete a standard observation sheet to gain insights into the quality of the children's social-emotional aspects, providing an additional perspective from those directly interacting with the participants. The mixed-method strategy aimed to enhance data accuracy and strengthen the validity of the research findings (Vivek & Nanthagopan, 2021). Therefore, the measurement instruments used in this study were selected based on their validity and reliability and were appropriate for the early childhood population.

The instrument used to measure the social-emotional development of kindergarten students in this study is based on the assessment developed by Rinekasari et al. (2021) the Children's Social-Emotional

Development assessment. This instrument consists of three leading indicators: Self-regulation, Self-responsibility, and Pro-social Behaviour. The Self-regulation indicator includes four observational components, Self-responsibility encompasses five observational components, and Pro-social Behaviour consists of five observational components. Each observational component is rated using a Likert scale with five options: Very Good, Good, Fair, Poor, and Very Poor. The instrument has a validity score of 0.67 and a reliability score of 0.89, making it a valid and reliable tool for measuring children's social-emotional development in the kindergarten age group.

The study on the impact of physical activity-based freedom of movement was conducted over 12 sessions. The practice schedule for the treatment group, which received the physical activity-based freedom of movement programme, is detailed in Table 3 below. The intervention began with a pre-assessment to measure the children's social-emotional development. Both pre- and post-assessments were carried out to determine the extent of any changes in the children's social-emotional development after the intervention, focusing on improvements in aspects such as self-regulation, self-responsibility, and pro-social behaviour during the intervention.

Table 3. Content Listing and Schedule

Session	Schedule	Topic	Activity
1		Pre-Assessment	
2	Session 1	Understanding Space	Exploring personal and public space
3	Session 2	Jumping and Landing	Jumping in various patterns, distances, and heights
4	Session 3	Shifting Body Weight and Rolling	Spinning, extending, rolling, and cartwheeling
5	Session 4	Throwing and Catching	Throwing from underhand, overhead, and sidearm at varying distances and heights
6	Session 5	Volleyball Hit	Hitting balloons and balls with various body parts
7	Session 6	Dribbling	Dribbling in different body positions
8	Session 7	Racket Hitting	Backhand and forehand hits in pairs
9	Session 8	Hitting with a Long-Handled Tool	Hitting targets at different distances and patterns
10	Session 9	Kicking and Directing	Kicking and stopping the ball in groups and pairs
11	Session 10	Dance Skills	Rhythmic activities, folk dance, and cultural dances
12		Post-Assessment	

Statistical analysis

This study employs dependent sample t-tests and independent sample t-tests to examine children's social-emotional development. The dependent sample t-test compares the differences before and after the intervention within the same group (Dankel & Loenneke, 2021). Meanwhile, the independent sample t-test tests the differences between two distinct groups: the treatment group and the control group (Kelter, 2020). Both tests help identify significant changes in the variables under examination, namely the children's social-emotional development, with a p-value < 0.05 indicating an essential difference between the treatment and control groups. This analysis is conducted to ensure the validity of the research findings in assessing the impact of the physical activity-based freedom of movement programme on social-emotional development in kindergarten.

Results

This study was conducted over 12 weeks, with the first session as a pre-assessment and the final session as a post-assessment. The assessment process utilised the Children's Social-Emotional Development instrument, involving collaboration between the teaching team and the researchers to obtain comprehensive assessment data. During sessions two to eleven, the treatment group received the physical activity-based freedom of movement programme, which lasted 60 minutes per session. This programme allowed children to move within structured physical activities that support their social and emotional development. In contrast, the control group followed conventional learning based on the existing curriculum, without including the physical activity-based freedom of movement programme, as experienced by the treatment group. The pre-assessment and post-assessment data collected from both groups are presented in Table 4, which illustrates a comparison of children's social-emotional development in the treatment and control groups throughout the study period.

Table 4. Differences in Pre-test and Post-test Scores

Data Group	Pre-assessment	Post-assessment
Treatment Group	X = 44.40 N = 65 SD = 3.93	X = 57.65 N = 65 SD = 4.61
Control Group	X = 44.52 N = 66 SD = 4.05	X = 52.23 N = 66 SD = 5.03

The data in the table above show differences between the treatment and control groups, particularly in the post-assessment results. The treatment group demonstrates a greater change in social-emotional scores compared to the control group, as evidenced by the comparison of the mean post-assessment scores of each group. While a difference is observed in the mean post-assessment scores of both groups, further statistical analysis is essential to confirm the significance, quality, patterns, and accuracy of the data obtained during the study. This process is also crucial for evaluating the validity of the data to ensure that the conclusions drawn are objective, accurate, and scientifically sound. Therefore, in-depth statistical analysis remains necessary to ensure that the findings of this research are scientifically acceptable and provide a strong foundation for making implementable recommendations.

Prerequisite Test

Before conducting parametric analysis, including both dependent and independent t-tests, the data obtained in this study must first undergo prerequisite tests. These prerequisite tests include normality and homogeneity tests. The normality test determines whether the data distribution follows a normal distribution. In contrast, the homogeneity test assesses the equality of variances between the compared groups. Normality and homogeneity of data are also key assumptions in parametric analysis. The results of these two tests will indicate whether the data meet the criteria to proceed with further parametric testing. Table 5 describes the normality test results performed on the data collected during this study. By ensuring that the data meet the prerequisites of normality and homogeneity, subsequent statistical analysis can be carried out more accurately and precisely, leading to valid and scientifically justifiable conclusions.

Table 5. Results of Normality Test Data Processing

Data Group	Variable	Kolmogorov-Smirnov	Distribution	P-Value
Treatment Group	Pre-assessment	0.177	Normal	> 0.05
	Post-assessment	0.092	Normal	> 0.05
Control Group	Pre-assessment	0.200*	Normal	> 0.05
	Post-assessment	0.193	Normal	> 0.05

Based on the results of the normality test analysis using SPSS 23, it was found that the Kolmogorov-Smirnov significance (sig.) values for the pre- and post-assessment data in both the treatment and control groups were all above 0.05 (sig. > 0.05). This indicates that the data obtained in this study follow a normal distribution. The next step after the normality test is the homogeneity test, which assesses the equality of variances between the groups. The results of the homogeneity test conducted in this study are presented below.

Table 6. Results of Homogeneity Test Data Processing

Variable	Levene Statistic	Distribution	P-Value
Pre-Post Assessment Treatment Group	0.193	Homogeneous	> 0.05
Pre-Post Assessment Control Group	0.88	Homogeneous	> 0.05
Post Assessment Treatment-Control Group	0.291	Homogeneous	> 0.05

The homogeneity test in this study was conducted using Levene's Statistic with the assistance of SPSS 23. Based on the results presented in the table above, it can be observed that the Levene's Statistic values for the Pre-Post Assessment Treatment Group, Pre-Post Assessment Control Group, and Post Assessment Treatment-Control Group all indicate calculated significance values greater than 0.05 (sig. > 0.05).

This suggests that the variances between the groups tested in this study are homogeneous, thus allowing the analysis to proceed to the following statistical stage.

Hypothesis testing

The hypothesis test was conducted to analyse the pre-post assessment results for both the treatment and control groups using a dependent t-test. The main objective of this test is to determine whether there is a significant difference between the pre-assessment and post-assessment data for each group. In other words, the first dependent t-test aims to assess whether the physical activity-based freedom of movement programme implemented in the treatment group significantly impacts the children's social-emotional development.

Table 7. Social-Emotional Development in the Treatment Group

Variable	Pair Diff.			t	df	Sig. 2-Tailed
	Mean	SD	SEM			
Pre-Post Assasment Treatment Group	13.246	4.191	0.502	25.482	64	0.001

Based on the results of the dependent t-test using SPSS 23, the calculated t-value for the pre-post assessment data in the treatment group is 0.001, which is smaller than 0.05 (sig. < 0.05). This indicates a significant difference between the pre-assessment and post-assessment in the treatment group. Following the dependent t-test for the treatment group, the next step is to conduct a dependent t-test for the pre-post data of the control group. The results of the dependent t-test for the control group are presented below.

Table 8. Social-Emotional Development in the Control Group

Variable	Pair Diff.			t	df	Sig. 2-Tailed
	Mean	SD	SEM			
Pre-Post Assasment Control Group	7.636	4.220	0.519	14.703	65	0.001

The results of the dependent t-test on the pre-post-assessment data for the control group showed a calculated significance value of 0.001, which is smaller than 0.05 (sig. calculated < 0.05), indicating a significant difference between the pre-assessment and post-assessment for the control group. After conducting the dependent t-test on both groups, the next step in the analysis was the independent t-test. The post-assessment data for the treatment and control groups were analysed using an independent t-test to further investigate the differences in social-emotional development between the treatment and control groups.

Table 9. Hypothesis Test Results for physical activity-based freedom of movement

Variable	t	df	Significance		Mean Difference	SED
			One-Sided p	Two-Sided p		
Post Assasment Treetment-Control Group	6.514	129	0.001	0.001	5.495	0.843

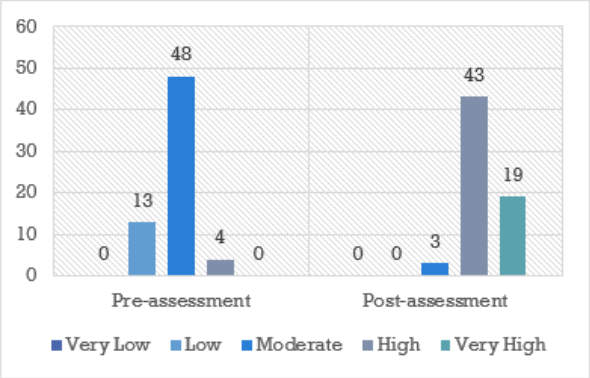
The independent t-test conducted on the Post-Assessment data for the Treatment-Control Group resulted in a calculated significance value of 0.001, which is less than 0.05 (sig. < 0.05). This indicates a significant difference in social-emotional development between the treatment and control groups. Therefore, it can be concluded that the intervention applied to the treatment group had a greater impact on social-emotional development than the control group.

The Impact of Physical Activity-Based Freedom of Movement on Social-Emotional Development

Based on the dependent sample t-test results for the treatment group, the t-value is 25.482 with 64 degrees of freedom, a mean of 13.246, standard deviation (SD) of 4.191, and standard error of the mean (SEM) of 0.502. With 63 degrees of freedom (df n-2 = 63), the critical t-value is 1.998, so the calculated t-value (25.482) is greater than the critical t-value (1.998). This data supports the conclusion that there

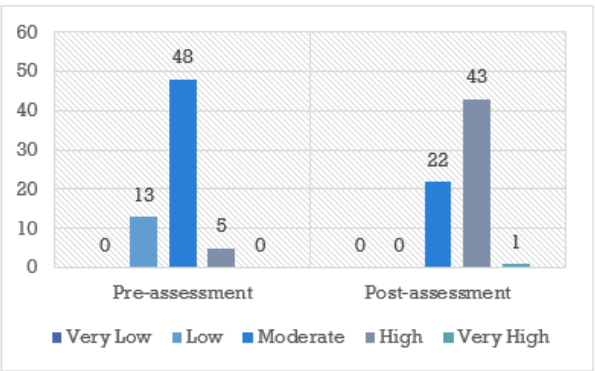
is a significant improvement in social-emotional development following the intervention with the physical activity-based freedom of movement programme. According to the pre-assessment results for the treatment group, the social-emotional condition of the students was as follows: 0 students in the "very low" category, 13 students in the "low" category, 48 students in the "moderate" category, four students in the "high" category, and zero students in the "very high" category. In contrast, the post-assessment results for the treatment group showed the following: 0 students in the "very low" category, zero students in the "low" category, three students in the "moderate" category, 43 students in the "high" category, and 19 students in the "very high" category. If the social-emotional conditions of the students during the pre-assessment and post-assessment are presented in a chart, it will appear as shown below.

Figure 2. Comparison of Pre-Post Assessment Results for the Treatment Group



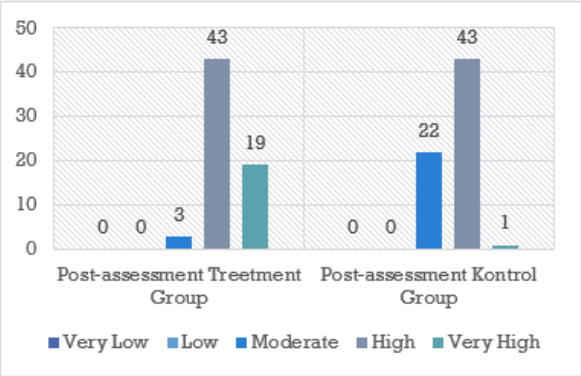
Based on the dependent sample t-test results for the control group, the t-value is 14.703 with 65 degrees of freedom, a mean of 7.636, standard deviation (SD) of 4.220, and standard error of the mean (SEM) of 0.519. With 64 degrees of freedom (df n-2 = 64), the critical t-value is 1.998, so the calculated t-value (14.703) is greater than the critical t-value (1.998). This data indicates a significant improvement in social-emotional development in the control group, which did not receive the physical activity-based freedom of movement programme and was taught conventionally according to the existing curriculum. According to the pre-assessment results for the control group, the social-emotional condition of the students was as follows: 0 students in the "very low" category, 13 students in the "low" category, 48 students in the "moderate" category, five students in the "high" category, and zero students in the "very high" category. In contrast, the post-assessment results for the control group showed the following: 0 students in the "very low" category, zero students in the "low" category, 22 students in the "moderate" category, 43 students in the "high" category, and one student in the "very high" category. If the social-emotional conditions of the students during the pre-assessment and post-assessment for the control group are presented in a chart, it will appear as shown below.

Figure 3. Comparison of Pre-Post Assessment Results for the Control Group



Based on the results of the independent sample t-test for the Post-Assessment Treatment-Control Group, the t-value is 6.514 with 129 degrees of freedom, a Mean Difference of 5.495, and a standard error difference (SED) of 0.843. With 129 degrees of freedom (df n-2 = 129), the critical t-value is 1.979, so the calculated t-value (6.514) is greater than the critical t-value (1.979). These data indicate that the treatment group experienced a significantly greater improvement in social-emotional development than the control group. This data can also serve as the basis for concluding this study, namely that physical activity-based freedom of movement significantly impacts the social-emotional development of kindergarten students. The increase in social-emotional components for students who received the physical activity-based freedom of movement programme was much more significant than that observed in students who did not. When the social-emotional conditions of the students during the Post-Assessment for both the Treatment and Control Groups are presented, they will appear as shown below.

Figure 4. Comparison of Post-Assessment Results for the Treatment and Control Groups



Discussion

The results of this study demonstrate a significant improvement in social-emotional development in the treatment group, with much higher outcomes than the control group. These findings align with St. Laurent et al. (2023) and Christian et al. (2021) assertion that physical activity is closely related to social-emotional skills, a fundamental foundation for a child's readiness to enter the school environment. Similarly, Gil-Moreno & Rico-González (2023) theory supports that children with strong emotional regulation and physical health can better adapt to academic and social demands, contributing to long-term learning success. The improvement in self-regulation, personal responsibility, and pro-social behaviour observed in the treatment group strengthens the argument that stimulation through physical activity-based freedom of movement provides a contextual, meaningful learning experience that aligns with the child's developmental stage. These findings also support Scheithauer et al. (2023) that early emotional management has broad implications for behaviour control and the achievement of learning goals. Therefore, physical activity-based freedom of movement is a tool for developing motor skills and a strategic medium for fostering empathy, independence, and essential social skills critical to early childhood development.

Physical activity-based freedom of movement plays a significant role in enhancing young children's self-regulation. Children learn to control impulses, adjust behaviours, and regulate emotions to align with social contexts through participation in games that involve rules (Xie et al., 2025). The results of this study indicate that the treatment group showed a significant improvement in self-regulation abilities following the intervention. This finding supports Padial-Ruz et al. (2022) research, emphasizing that physical activity can enhance a child's capacity to manage behaviour and maintain focus. In line with this, Wang et al. (2022) and Yalvaç Arıcı (2024) highlights that consistent motor experiences from an early age form a crucial foundation for self-control and sound decision-making. A similar point was also made by Antipe Vásquez et al., (2025), who stated that play should be used as a driving force for children's social and cognitive development. Therefore, it can be concluded that physical activity-based freedom of movement supports motor development. It is an effective pedagogical strategy to foster self-regulation, essential for children's learning readiness.

Children's participation in physical activity-based freedom of movement also significantly strengthens pro-social behaviour. Children learn to build positive relationships with their peers through various forms of play that require cooperation, role-sharing, and communication. Hertiki et al., (2025) assert that physical activity trains children to interact constructively and fosters empathy, helpfulness, and a willingness to appreciate differences. The results of this study indicate that the treatment group showed a higher increase in pro-social behaviour compared to the control group, reinforcing the argument that physical activity can be an effective medium for stimulating healthy social interactions. This finding aligns with Mayra et al. (2022) and San et al. (2021) theory, suggesting that active play participation develops social skills while strengthening emotional bonds between individuals. Thus, freedom of movement in the context of physical activity impacts motor skills and self-regulation and plays a vital role in shaping pro-social behaviour, providing a foundation for social interactions in early childhood.

Implementing physical activity-based freedom of movement has significantly strengthened pro-social behaviour in young children. Through group activities requiring cooperation, children learn to share roles, respect rules, and prioritise the common good. The learning environment in physical activity encourages the development of empathy, tolerance, and a willingness to help peers, thereby enhancing the quality of positive social relationships (Hannah et al., 2025; Ourda et al., 2025). The results of this study indicate that children in the treatment group demonstrated a significant improvement in pro-social behaviour compared to the control group. According to Goh et al. (2022), physical activity can serve as an effective medium for developing social skills and expanding children's emotional experiences. Consistent with Taylor & Boyer, (2020) developmental theory, active and interactive play experiences allow children to practise communication, conflict resolution, and constructive collaboration. Therefore, freedom of movement through physical activity can be considered a relevant pedagogical strategy in shaping pro-social behaviour, essential for children's social and academic readiness.

The comparison of the research results between the treatment and control groups clearly demonstrates a significant difference in the social-emotional development of kindergarten children. Based on the independent sample t-test results on the post-assessment data, the calculated t-value of 6.514 is greater than the critical t-value of 1.979 (6.514 > 1.979). Statistically, this proves a significant difference between the two groups, with children in the treatment group showing a higher improvement in self-regulation, social responsibility, and pro-social behaviour. This achievement indicates that the physical activity-based freedom of movement intervention successfully encourages children to learn to manage emotions, cooperate with peers, and display positive behaviour in daily interactions. The strength of this programme lies in providing freedom of movement within a structured physical activity framework, allowing children to channel their energy productively while gaining meaningful learning experiences. In contrast, conventional learning, which focuses more on sitting, listening, and statically completing tasks, limits children's opportunities to develop their social-emotional skills fully. These findings support McGowan et al., (2024) view that early childhood education curricula must integrate more physical activity-based approaches. Therefore, it can be concluded that physical activity-based freedom of movement is an effective learning strategy in shaping children's character, social skills, and emotional readiness to face subsequent developmental challenges

The findings of this study also demonstrate that structured physical activity-based freedom of movement significantly strengthens young children's social-emotional development, including improvements in self-regulation, personal responsibility, and pro-social behaviour. Bai et al. (2024) contend that physical activities in early childhood should not merely aim at developing motor skills, but should also incorporate meaningful physical experiences to foster cognitive and social development. Therefore, it can be emphasised that the key novelty of this research is that physical activity-based freedom of movement can be positioned as an innovative pedagogical strategy, distinct from the conventional teaching models traditionally used in Indonesia. By providing children with the space to channel their energy while interacting constructively, this educational activity has effectively fostered empathy, independence, and the quality of social relationships (Aslanian et al., 2024; Nordin & Mohamed, 2023). Motor-based physical activity can reduce the risk of overweight and obesity among preschool children (Castro gonzález et al., 2025). Consequently, the findings of this study not only enrich the literature on early childhood education but also offer practical contributions to the development of a more contextual, sustainable, and developmentally relevant curriculum

The practical implications of this study suggest that physical activity-based freedom of movement should be systematically integrated into the early childhood education curriculum, particularly through play-based learning that offers ample space for movement, flexible rules, and positive social interactions. Vuković et al. (2023) the study's findings can be implemented by designing a structured physical activity schedule that balances cognitive, affective, and pro-motor skills development. In implementing these findings, it is recommended that teachers receive specialised training in designing, managing, and evaluating physical activity-based freedom of movement to ensure the intervention is consistently and effectively carried out. Further research should include long-term studies to assess the sustainability of this intervention's impact on children's development in subsequent educational stages. Additionally, variations in settings, such as urban and rural environments, should be explored to understand the socio-cultural contexts that may influence the programme's effectiveness. Pilot studies using more rigorous experimental designs, such as randomised controlled trials, are also needed to strengthen the validity of the findings and provide a more robust empirical foundation for early childhood education policy-making.

Conclusions

The conclusion of this study reaffirms that physical activity-based freedom of movement significantly impacts young children's social-emotional development. The statistical results show a higher improvement in the treatment group than the control group, across aspects of self-regulation, personal responsibility, and pro-social behaviour. The shift in developmental categories from low to high and very high in the treatment group demonstrates that this intervention can create a more meaningful, contextual, and developmentally appropriate learning experience. Therefore, this intervention can be seen as a practical pedagogical approach in optimising children's readiness for formal education.

In addition to providing theoretical contributions by enriching the literature on early childhood education, this study also offers substantial practical implications. Integrating physical activity-based freedom of movement into the early childhood education curriculum has been shown to balance motor skill development with strengthening social-emotional competencies. Teachers are expected to design and manage physical activity-based freedom of movement activities that encourage positive social interactions, empathy, and children's independence. These findings also open avenues for further research to examine the long-term sustainability of the intervention's impact and its relevance across various socio-cultural contexts, reinforcing the foundation for more inclusive and sustainable educational policies.

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