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Research Article

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Effects of indoor and outdoor play on children's gross motor development: Implications for early childhood instructional design

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ABSTRACT

In spite of the growing evidence of the benefits of both indoor and outdoor play, studies on the effects of these play environments on gross motor skill development remain largely underexplored. Also, children spend more time on sedentary activities as against physical play which affects their childhood development. Thus, this study examined the impact of indoor and outdoor play sessions on children's gross motor skills, with a focus on physical strength, coordination, balance, stability, spatial awareness, body control, timing, and rhythm and its implications on early childhood instructional design. A pre-/post-test quasi-experimental design was used involving 32 children aged 3-5 years, randomly assigned into indoor play group (experimental group A) and outdoor play group (experimental group B). Data were collected using a performance-based assessment tool validated by early childhood education experts, and analyzed using mean, standard deviation, and analysis of covariance. The results revealed significant improvements in children's gross motor skills with a medium effect size, with outdoor play sessions showing greater gains in physical strength, coordination, balance, stability, and timing compared to indoor play. These findings provide insights into the benefits of outdoor play in enhancing motor development. The findings of this study have implications for policy makers and early childhood instructional designers on the need to incorporate play into children's educational experiences to enhance gross motor development in order to boost emotional, cognitive, and social develoomment of children for enhanced physical growth academic performance. Consequently, the study recommends that instructional designers should prioritize outdoor play activities within early childhood education programs to foster gross motor development, emphasizing the importance of movement, exploration, and physical engagement in open play environments for optimal developmental outcomes.

Keywords: indoor play, outdoor play, gross motor development, instructional design

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INTRODUCTION

Problem Statement and Study Background

Play is generally viewed as a voluntary, enjoyable and internally motivated behavioral pattern that gives children opportunities for exploration, creativity and learning. Play is widely regarded as an important tool for development in early childhood as it enables children to explore their environment, problem-solving skills and enhances creativity (Ozturk et al., 2025). For children to develop in all facets at an early stage of education, there is need to incorporate play into their activities to develop their gross motor skills (Tortella et al., 2022). Despite the importance of play in the general educational, social and cognitive wellbeing and overall health of children, most young children spend a lot of time on sedentary behaviors instead of physical play that will improve their overall growth (Lauricella et al., 2015). For instance, Prioreschi et al. (2017) found in their study that 3-month-old babies were already exposed to thirty-minute television programs daily and over two hours daily in restrained positions which affects the psycho-social health and wellbeing of children below four years. Similarly, Hao et al. (2025) also believed that engaging children in play improves their development and cognitive development. Luukkainen et al. (2025) also stated that subjecting children to participation in play improves their motor competence.

Furthermore, research evidence has also shown that there is a negative trend in children's gross motor skills due to lack of enough play activities and this is linked to the fact that children do not meet their daily physical play recommendation as a result of increase in sedentary behavior (Bardid et al., 2015; Brian et al., 2018, 2019). Additionally, many studies have shown that play facilitates the development of gross motor skills amongst school children which is very vital towards their cognitive, physical and emotional development (Palma et al., 2014; Robinson et al., 2016).

More importantly, previous studies seem to have concentrated on the effectiveness of physical activities like outdoor and indoor play activities on children's cognition, attention and achievement, however very few attention is given to the effect of those type of play on children's gross-motor skills (Nisa et al., 2024; Shoval et al., 2014). In view of the aforementioned, the development of gross-motor skills is very vital to the physical development and wellbeing of children. The outdoor and indoor play environment has what it takes to develop the gross-motor skills of children.

Early childhood is considered to be very vital for the physical, social and cognitive development of children between 3-5 years of age. In terms of cognitive development, the initial first three years of a child is very vital in their development and play is a very vital element towards achieving that (Craig et al., 2024). In view of this, play plays a vital role in this development because children are able to interact and explore the environment while also learning and developing their skills through those plays (Friedman et al., 2021; Spring et al., 2024). WHO (2019) provides some guidelines that children should be given openings to take part in a variety of developmentally suitable, harmless and pleasurable play-based physical events. The guidelines propose that children 5 years or less should be physically active for at least 180 minutes in any intensity throughout the day.

At birth, infants have minimal control over their bodies. However, within a few years, they acquire essential motor skills that enable them to sit, stand, walk, manipulate objects, and communicate. This rapid progression highlights the importance of fostering environments that support motor and cognitive development. Play, a natural and engaging activity for children, offers opportunities to explore, experiment, and develop critical skills necessary for lifelong growth and learning. Play is instrumental in facilitating the development of gross motor skills, including balance, strength, and coordination. Through active engagement in physical activities, children refine the movements that form the basis for more complex motor skills. Numerous studies have established a strong connection between motor skill development and broader developmental domains, such as social, emotional, and cognitive growth (Chen et al., 2021; Ramos-Campo & Clemente-Suárez, 2024). These findings emphasize the need to incorporate physical activities into early childhood education to support holistic development.

Outdoor play is any type of play that takes place in outdoor settings like garden, park, or playground. It is essential for children's as it makes them to interact with the environment, engage in physical activities and also access memory experiences. Outdoor play provides a rich, diverse environment where children can develop and grow gross motor skills due to active engagement (Ozturk et al., 2025). Outdoor play is characterized by unstructured, spontaneous activities in natural settings, providing opportunities for dynamic movements like running, climbing, and crawling. This type of play fosters physical development by encouraging children to explore and interact with their surroundings (Oh, 2024). Conversely, indoor play typically takes place in more controlled and structured environments, often involving toys or interactive materials that nurture cognitive skills and fine motor development. While each environment offers distinct benefits, understanding their respective contributions to gross motor skill development is critical to optimizing early learning strategies.

In recent years, substantial research has highlighted the multifaceted benefits of motor skill development. Proficiency in motor skills has been closely associated with improved cognitive and academic performance (Peng & Feng, 2022; Ramos-Campo & Clemente-Suárez, 2024). Beyond physical health, motor skills contribute to mental and social development, underscoring the integral role of physical activities in supporting brain development (Chen et al., 2021; Shi et al., 2022).

Motor development is essential not only for academic success but also for fostering children's social and emotional growth. Play serves as a vital medium through which children engage in physical activities, refining advanced motor abilities. Movement acts as a form of perception, integrating proprioceptive and haptic senses with external inputs such as vision and hearing, forming the foundation of experiential learning. Thus, providing children with diverse opportunities for movement across a range of activities is crucial for enriching their motor skills and overall development. Research consistently demonstrates that physical activity enhances social-emotional growth, cognitive development, and psychological well-being while reducing risks for cardiovascular issues and degenerative diseases (Bize et al., 2022; Gabbard et al., 2021).

Moreover, studies also suggest that outdoor play is essential for holistic child development. It improves cardiovascular fitness, refines motor skills, and enhances cognitive, social, and emotional growth (Dankiw et al., 2021; Jean & Jun, 2021; Scott et al., 2022). This is based on the premise that outdoor play fosters creativity and curiosity while enabling unstructured social interactions, which are vital for learning conflict resolution and developing critical social skills. Indoor play environments, meanwhile, offer controlled settings that enhance precision, coordination, and other fine motor abilities. Furthermore, activities conducted in indoor and outdoor environments have been shown to foster linguistic, cognitive, and social development, along with practical skills like mathematics and critical thinking (Tri, 2022).

Studies have highlighted the significant benefits of outdoor activities on young children's developmental growth, emphasizing improvements in cognitive, emotional, and physical well-being. Research supports integrating natural environments into early learning settings to complement traditional indoor education. For instance, Ernst and Burcak (2019) found that unstructured play in nature preschools fosters essential dispositions such as curiosity, persistence, and creative thinking, alongside executive function skills exceeding national norms. Lundy and Trawick-Smith (2020) further observed that active outdoor play enhances on-task classroom behavior, particularly benefiting boys and children from low socioeconomic backgrounds. Similarly, Carr et al. (2017) demonstrated that well-designed nature playscapes improve executive function components like flexibility, planning, and inhibitory control. Collectively, these studies emphasize the importance of outdoor play in fostering critical skills and promoting holistic development. Ozturk et al. (2025) discovered that play is recognized as an essential element in children's cognitive, physical and socio-emotional development. The study of

Squires et al. (2025) also discovered that play could positively improve children's learning and their all-round development. Furthermore, Stringer et al. (2025) also reported that engaging children in play improves their fundamental movement skills even though the study discovered no significant improvement across the different playgrounds that were studied. In a combined systematic review and meta-analysis involving 1416 studies, Liu et al. (2025) discovered that active play and skill-oriented physical education has a comparable effect on children development. Wu et al. (2024) conducted a study to check the effects of kindergarten physical education using different plays and discovered that involving children in early childhood play enhances development in a holistic manner. In a systematic review on the effect of active play on children's fundamental movement skills, Zhang et al. (2025) reported that subjecting children to play enhances children's motor skills and cognitive development. Additionally, Spring et al. (2025) discovered that subjecting children to 8-week active play improves gross motor skills and development. Also, Cankaya et al. (2025) further that there is a very strong relationship between the rate at which children are exposed to play and their levels of cognitive, socio-emotional and physical development. The study of Biino et al. (2025) also revealed that the more children are subjected to play, the more their motor skill development and their overall physical development.

Beyond developmental gains, outdoor play addresses rising concerns about excessive screen time among young children, which has been linked to adverse health outcomes such as obesity. Dankiw et al. (2023) highlighted how nature play offers a proactive alternative by promoting physical activity and reducing sedentary behaviors. Their findings reveal that engaging in outdoor activities can effectively counterbalance the negative effects of prolonged screen exposure, supporting healthier lifestyles. Together, these studies advocate for incorporating nature-based play into early childhood education to enhance cognitive and physical well-being, improve executive functioning, and mitigate the impact of screen time. By prioritizing outdoor engagement, educators and caregivers can provide young learners with opportunities to thrive across multiple developmental domains.

Nonetheless, despite growing evidence of the benefits of both indoor and outdoor play, the respective effects of these environments on gross motor skill development remain underexplored. Early learning centers often incorporate a mix of play settings, yet practical constraints such as space and time can limit their implementation. While outdoor play encourages dynamic movements that support physical exploration, indoor play allows for structured activities conducive to fine motor development. The differences between these settings highlight the need for focused research to evaluate their specific contributions to children's gross motor skill development. Outdoor play environments promote activities such as running, climbing, and jumping, fostering skills like balance and coordination. Indoor play environments, in contrast, often support activities that require precision, timing, and rhythm. Understanding how these settings uniquely influence motor skill acquisition will provide valuable insights for educators and policymakers.

This study therefore investigates the effects of indoor and outdoor play on gross motor development in pre-kindergarten children. The findings of this research will provide insights on evidence-based guidance for designing and implementing effective early learning strategies that could promote comprehensive developmental outcomes. Our study will form an insight into the need for instructional designers to incorporate play in school curricula and activities in order to facilitate all-round development of children at early levels of education.

Research Questions

The following questions were answered in the study:

1. What is the difference in gross motor skills related to physical strength and coordination among children exposed to indoor and outdoor play sessions?
2. What is the difference in gross motor skills related to balance and stability among children exposed to indoor and outdoor play sessions?
3. What is the difference in gross motor skills related to spatial awareness and body control among children exposed to indoor and outdoor play sessions?
4. What is the difference in gross motor skills related to timing and rhythm among children exposed to indoor and outdoor play sessions?

Hypotheses

The following null hypotheses were tested in this study:

1. **HO_1.** There is no significant difference in the mean scores of children's gross motor skills related to physical strength and coordination when exposed to indoor and outdoor play sessions.
2. **HO_2.** There is no significant difference in the mean scores of children's gross motor skills related to balance and stability when exposed to indoor and outdoor play sessions.
3. **HO_3.** There is no significant difference in the mean scores of children's gross motor skills related to spatial awareness and body control when exposed to indoor and outdoor play sessions.
4. **HO_4.** There is no significant difference in the mean scores of children's gross motor skills related to timing and rhythm when exposed to indoor and outdoor play sessions.

METHODOLOGY

The research design adopted in this study was a quasi-experimental pre-/post-test control group design. Quasi-experimental design enables researchers to make use of intact classes that are non-equivalent and non-randomized in order to be used in a particular study that seeks to determine a cause and effect relationship (Edmonds & Kennedy, 2017; Falode & Mohammed, 2023; Mohammed et al., 2024b). In this study, children were divided into two groups: experimental group A (outdoor play) and experimental group B (indoor play). Group A had access only to the outdoor play area throughout the study, allowing the researchers to examine the impact of the outdoor environment on gross motor skills, including physical strength, coordination, balance, stability, spatial awareness, body control, timing, and rhythm. Group B used only the indoor playroom, which was equipped with materials aimed at promoting gross motor development, providing a basis for assessing the indoor environment's effects on the same set of skills. Pre- and post-test assessments of all participants were conducted to compare the impacts

of the indoor and outdoor play settings on children's motor skill development.

The population of the study consisted of all the children in a Nigerian creche center. Thirty-two children, aged 3-5, with parental consent, were specifically chosen for the study and randomly assigned to experimental group A and experimental group B. A performance-based assessment instrument was used for data collection, which was validated by three experts in early childhood education and child development, which also yielded a value of 0.79 using Kuder-Richardson 20 formula. The instrument was organized into sections to measure specific motor skills, including balance, coordination, spatial awareness, body control, timing, and rhythm.

Ethical Consideration

Ethical considerations were ensured by obtaining informed consent from the caregivers of the children and assuring confidentiality, as well as allowing participants the right to withdraw from the study at any time. Thus, in line with the Helsinki declaration of ensuring standardized ethical standards involving human subjects, written informed consent was sought and signed where the participants were assured of their privacy and data anonymity throughout the duration of the study (Mohammed et al., 2025). Participants were also informed that the outcome of the study would be published in a reputable journal to advance the frontiers of knowledge.

Experimental Procedure

The children attended the play session twice a week, with each session lasting 1 hour, over a period of three months. A rubric was developed for each motor skill, defining skill levels as beginning, developing, proficient, and advanced. Each level was assigned a score from 1 to 4 points, with beginning receiving 1 point and advanced receiving 4 points. Four trained observers, who were familiar with the expected performances, used these rubrics to assess the children's skills. The observations were conducted unobtrusively, allowing children to display their skills without being aware they were being observed. In order to eliminate Hawthorn effect whereby participants alter their behaviors due to the fact that they have realized their behavior being studied thus affecting research outcomes due to maturation (McCambridge et al., 2014), the researchers liaised with the care-givers of the various centers in order to control for the effect of teacher variable and hawthorn effect. Each child was assigned a code name for their individual recording sheet, where the observer marked their scores as the skills were demonstrated. The total score for each child was transferred to a master spreadsheet, which organized the scores under the appropriate group. These instruments were administered at the beginning of the observations to determine the children's entering performance (pre-test) and were also given as a post-test after three months of experimental sessions to assess progress.

Method of Data Analysis

Statistical analysis was conducted using mean and standard deviation (SD) to summarize the data and compare the mean gains in children's gross motor skills from pre- to post-test for each group. In order to justify the use of parametric statistics, a normality test was conducted using Kolmogorov-Smirnov and the data revealed that $p > 0.05$ which suggests the data were normally distributed (Mohammed et al., 2024a**)**. Additionally, the kurtosis and skewness of the data set falls within the acceptable range for a normality distribution (Mohammed et al., 2025). Analysis of covariance (ANCOVA) was then used to compare the differences in the mean scores of children's gross motor skills between the two groups. The result of the pre-test was first paired using ANCOVA to check for the level of equivalence of the groups, and the result revealed a significant difference ($p < 0.05$) which means the need to check for the effect of the covariate because the two groups were not equivalent right from onset. Thus, in order to normalize the variance, ANCOVA was used. Before conducting the ANCOVA test, the researchers conducted some assumption tests to justify the usage of ANCOVA. First, in addition to the normality test that revealed $p > 0.05$, as well as Kurtosis and Skewness of the data set which reveals a normal distribution, we also conducted a test for homogeneity of variance which confirms that the spread of the scores across the various treatment groups is the same ($p > 0.05$). There are many procedures for testing homogeneity of variance but we used Levene's test which is the commonest, and the result revealed that the spread of the data set across the different treatment groups was the same ($p > 0.05$). Furthermore, we conducted a test of regression slope by checking for the interaction effect of the covariate across all the treatment groups in order to check whether the relationship between the covariate (pre-test) and the dependent variable is the same across all the treatment groups and the result revealed that $p > 0.05$, which means that the homogeneity of regression slope assumption was not violated. The use of ANCOVA serves as a control for the effect of the pre-test scores (covariate). The result was computed using SPSS software version 25.

Table 1. Pre-/post-test mean gross motor skills in physical strength and coordination for children in indoor and outdoor play sessions

Method	N	Pre-test		Post-test		Mean gain
		Mean	SD	Mean	SD	
Indoor play	16	38.60	3.97	52.90	4.59	14.30
Outdoor play	16	35.87	4.69	50.84	6.62	14.97

RESULTS

Answering Research Questions

Research question 1. What is the difference in gross motor skills related to physical strength and coordination among children exposed to indoor and outdoor play sessions?

Table 1 shows the mean and SD of pre-test, post-test, and mean gain scores of children's gross motor skills related to physical strength and coordination when exposed to indoor and outdoor play sessions. The result revealed that children exposed to indoor motor skills had a pre-test mean score of 38.60 (SD = 3.97) and a post-test mean of 52.90 (SD = 4.59), resulting in a mean gain of 14.30. Similarly, children exposed to outdoor motor skills had a pre-test mean score of 35.87 (SD = 4.69) and a post-test mean of 50.84 (SD = 6.62), leading to a mean gain of 14.97. The results indicate a difference between pre- and post-test mean scores, with an improvement in gross motor skills in both indoor and outdoor groups, favoring the post-test scores. This suggests that children in both groups perform better post-tests in terms of physical strength and coordination.

Figure 1 shows the graphical illustration of the pre-/post-test mean gross motor skills in physical strength and coordination for children in indoor and outdoor play sessions.

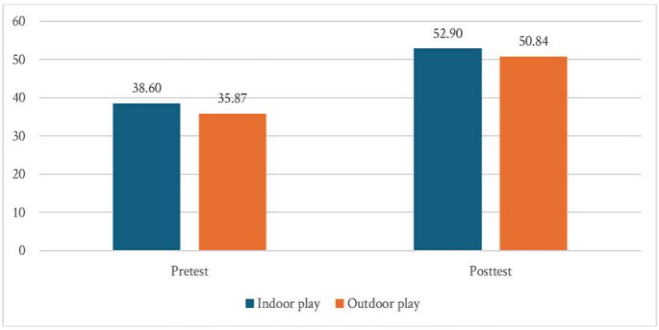

Figure 1. Graphical illustration of the pre-/post-test mean gross motor skills in physical strength and coordination for children in indoor and outdoor play sessions (Source: Authors' own elaboration)

Table 2. Pre-/post-test mean balance and stability gross motor skills for children in indoor and outdoor play sessions

Method	N	Pre-test		Post-test		Mean gain
		Mean	SD	Mean	SD	
Indoor play	16	44.35	8.99	62.99	6.41	18.64
Outdoor play	16	38.81	8.76	58.47	8.01	19.66

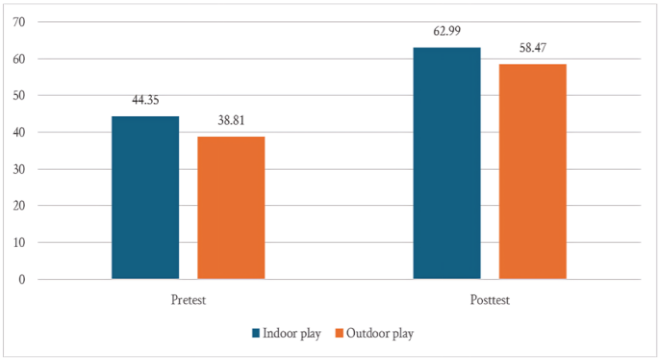

Figure 2. Graphical illustration of the pre-/post-test mean balance and stability gross motor skills for children in indoor and outdoor play sessions (Source: Authors' own elaboration)

Table 3. Pre-/post-test mean gross motor skills related to spatial awareness and body control for children in indoor and outdoor play sessions

Method	N	Pre-test		Post-test		Mean gain
		Mean	SD	Mean	SD	
Indoor play	16	38.27	4.30	52.84	4.66	14.57
Outdoor play	16	37.59	4.82	42.96	7.34	5.37

Research question 2. What is the difference in gross motor skills related to balance and stability among children exposed to indoor and outdoor play sessions?

Table 2 shows the mean and SD of pre-test, post-test, and mean gain scores of children's gross motor skills related to balance and stability when exposed to indoor and outdoor play sessions. The result revealed that children exposed to indoor motor skills had a pre-test mean score of 44.35 (SD = 8.99) and a post-test mean of 62.99 (SD = 6.41), resulting in a mean gain of 18.64. Similarly, children exposed to outdoor motor skills had a pre-test mean score of 38.81 (SD = 8.76) and a post-test mean of 58.47 (SD = 8.01), leading to a mean gain of 19.66. The results suggest that children in both groups showed significant improvements post-test in balance and stability, with outdoor play yielding a higher mean gain.

Figure 2 shows the graphical illustration of the pre-/post-test mean balance and stability gross motor skills for children in indoor and outdoor play sessions.

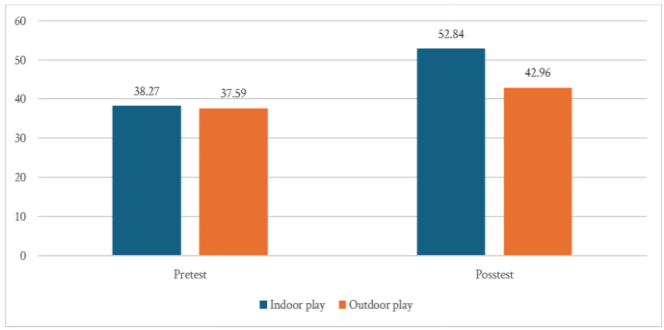

Figure 3. Graphical illustration of the pre-/post-test mean gross motor skills related to spatial awareness and body control for children indoor and outdoor play sessions (Source: Authors' own elaboration)

Table 4. Pre-/post-test mean gross motor skills related to timing and rhythm among children exposed to indoor and outdoor play sessions

Method	N	Pre-test		Post-test		Mean gain
		Mean	SD	Mean	SD	
Indoor play	16	41.67	9.41	61.99	5.99	20.32
Outdoor play	16	42.83	10.41	53.18	9.53	10.35

Research question 3. What is the difference in gross motor skills related to spatial awareness and body control among children exposed to indoor and outdoor play sessions?

Table 3 shows the mean and SD of pre-test, post-test, and mean gain scores of children's gross motor skills related to spatial awareness and body control when exposed to indoor and outdoor play sessions. The result revealed that children exposed to indoor motor skills had a pre-test mean score of 38.27 (SD = 4.30) and a post-test mean of 52.84 (SD = 4.66), resulting in a mean gain of 14.57. Children exposed to outdoor motor skills had a pre-test mean score of 37.59 (SD = 4.82) and a post-test mean of 42.96 (SD = 7.34), resulting in a mean gain of 5.37. The results suggest that indoor play showed a more significant improvement in spatial awareness and body control compared to outdoor play, although both groups demonstrated improvement.

Figure 3 shows the graphical illustration of the pre-/post-test mean gross motor skills related to spatial awareness and body control for children indoor and outdoor play sessions.

Research question 4. What is the difference in gross motor skills related to timing and rhythm among children exposed to indoor and outdoor play sessions?

Table 4 shows the mean and SD of pre-test, post-test, and mean gain scores of children's gross motor skills related to timing and rhythm when exposed to indoor and outdoor play sessions. The result revealed that children exposed to indoor motor skills had a pre-test mean score of 41.67 (SD = 9.41) and a post-test mean of 61.99 (SD = 5.99), resulting in a mean gain of 20.32. Children exposed to outdoor motor skills had a pre-test mean score of 42.83 (SD = 10.41) and a post-test mean of 53.18 (SD = 9.53), leading to a mean gain of 10.35. The results indicate that both groups showed improvement in timing and rhythm, with indoor play showing a higher mean gain.

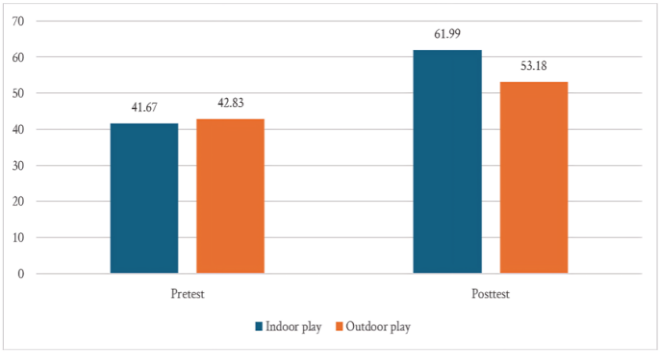

Figure 4. Graphical illustration of the pre-/post-test mean gross motor skills related to timing and rhythm among children exposed to indoor and outdoor play sessions (Source: Authors' own elaboration)

Figure 4 shows the graphical illustration of the pre-/post-test mean gross motor skills related to timing and rhythm among children exposed to indoor and outdoor play sessions.

Testing of Hypotheses

H0₁. There is no significant difference in the mean scores of children's gross motor skills related to physical strength and coordination when exposed to indoor and outdoor play sessions

The result in **Table 5** shows that there was a statistically significant difference in children's gross motor skills related to physical strength and coordination when exposed to indoor and outdoor play sessions ($F = 191.717$, $p = 0.000$, $\eta^2 = 0.360$). Since the p-value is less than 0.05, the null hypothesis is rejected. This means there was a significant difference in favor of outdoor play sessions, which had a higher mean score. The effect size ($\eta^2 = 0.360$) indicates that 36% of the variance in children's gross motor skills related to physical strength and coordination can be attributed to outdoor play sessions. The effect size noticed in this result is considered to be medium (Cohen, 1988). This result suggests that outdoor play sessions, with their larger and more open environments, provide more opportunities for children to engage in activities that improve their physical strength and coordination, making them more effective than indoor play sessions in promoting these aspects of gross motor skills development.

H0₂. There is no significant difference in the mean scores of children's gross motor skills related to balance and stability when exposed to indoor and outdoor play sessions

The ANCOVA result in **Table 6** shows a statistically significant difference in the mean scores of children's gross motor skills related to balance and stability when exposed to indoor and outdoor play sessions ($F = 207.287$, $p = 0.000$, $\eta^2 = 0.378$). The p-value is less than the 0.05 significance level, which led to the rejection of the null hypothesis. The results indicate that outdoor play sessions have a significantly higher mean score compared to indoor play sessions in enhancing children's balance and stability. The effect size ($\eta^2 = 0.378$), which is medium (Cohen, 1988; Sobowale et al., 2024), suggests that 37.8% of the variance in balance and stability can be attributed to the use of outdoor play sessions. This significant difference reflects that outdoor play sessions provide more varied and larger spaces for children to practice their balance and stability, leading to higher improvements in these gross motor skills compared to indoor play sessions.

H0₃. There is no significant difference in the mean scores of children's gross motor skills related to spatial awareness and body control when exposed to indoor and outdoor play sessions

Table 7 displays a statistically significant difference in the mean scores of children's gross motor skills related to spatial awareness and body control when exposed to indoor and outdoor play sessions ($F = 77.071$, $p = 0.000$, $\eta^2 = 0.405$). The p-value of 0.000 is less than the significance level of 0.05, leading to the rejection of the null hypothesis. The results indicate that outdoor play sessions were significantly more effective in improving spatial awareness and body control than indoor play sessions. The medium effect size ($\eta^2 = 0.405$) observed (Cohen, 1988), shows that 40.5% of the variance in children's spatial awareness and body control is attributed to outdoor play sessions. The high impact of outdoor play sessions on spatial awareness and body control can be attributed to the greater opportunities for physical movement in open environments, where children can more easily explore their body's space and coordination.

Table 5. ANCOVA of the difference in mean children's gross motor skills related to physical strength and coordination when exposed to indoor and outdoor play sessions

Source	Type III sum of squares	df	Mean square	F	Significance	Partial eta squared
Corrected model	8,242.011[a]	1	4,121.005	104.676	.000	.380
Intercept	7,412.684	1	7,412.684	188.286	.020	.356
Pretest	439.391	1	439.391	11.161	.004	.032
Methods	7,547.785	1	7,547.785	191.717	.000	.360
Error	13,424.940	28	39.369			
Total	799,623.000	32				
Corrected total	21,666.951	31				

Table 6. ANCOVA of the difference in mean scores of children's gross motor skills related to balance and stability when exposed to indoor and outdoor play sessions

Source	Type III sum of squares	df	Mean square	F	Significance	Partial eta squared
Corrected model	17,477.982[a]	1	8,738.991	259.463	.000	.603
Intercept	20,962.280	1	20,962.280	622.377	.000	.646
Pretest	10,659.228	1	10,659.228	316.476	.021	.481
Methods	6,981.622	1	6,981.622	207.287	.000	.378
Error	11,485.227	28	33.681			
Total	1,157,590.00	32				
Corrected total	28,963.209	31				

Table 7. ANCOVA of the difference in mean scores of children's gross motor skills related to spatial awareness and body control when exposed to indoor and outdoor play sessions

Source	Type III sum of squares	df	Mean square	F	Significance	Partial eta squared
Corrected model	8,770.237[a]	1	2,923.412	77.071	.000	.335
Intercept	7,558.547	1	7,558.547	199.26	.000	.370
Pretest	391.524	1	391.524	10.322	.001	.029
Methods	16.930	1	16.930	.446	.002	.405
Error	12,896.713	28	37.932			
Total	799623.000	32				
Corrected total	21,666.951	31				

Table 8. ANCOVA of the difference in mean scores of children's gross motor skills related to timing and rhythm when exposed to indoor and outdoor play sessions

Source	Type III sum of squares	df	Mean square	F	Significance	Partial eta squared
Corrected model	18,182.685[a]	1	6,060.895	191.151	.030	.639
Intercept	20,434.684	1	20,434.684	644.476	.020	.655
Pretest	11,279.393	1	11,279.393	355.734	.010	.511
Methods	.421	1	.421	.013	.004	.628
Error	10,780.524	28	31.707			
Total	1,157,590.00	32				
Corrected total	28,963.209	31				

H04. There is no significant difference in the mean scores of children's gross motor skills related to timing and rhythm when exposed to indoor and outdoor play sessions

ANCOVA result in **Table 8** shows a statistically significant difference in the mean scores of children's gross motor skills related to timing and rhythm when exposed to indoor and outdoor play sessions ($F = 191.151$, $p = 0.030$, $\eta^2 = 0.628$). Since the p-value is less than 0.05, the null hypothesis was rejected. The outdoor play sessions demonstrated a higher mean score, suggesting a more significant impact on children's development of timing and rhythm. The effect size ($\eta^2 = 0.628$) indicates that 62.8% of the variance in the timing and rhythm scores can be attributed to the use of outdoor play sessions. This effect size, according to Cohen (1988), is considered to be medium. This result suggests that outdoor play sessions, with their varied activities and larger spaces, better support the development of children's timing and rhythm, as they can practice these skills in a more dynamic environment.

DISCUSSION OF FINDINGS

The findings of this study reveal that both indoor and outdoor play sessions had positive effects on children's gross motor skills, though with varying impacts on specific areas. Children exposed to indoor play showed higher gross motor skills related to physical strength and coordination, as well as balance and stability, compared to those engaged in outdoor play. These findings may be attributed to the structured nature of indoor activities, which might better facilitate tasks that require precise motor control and coordination. These results are consistent with the studies of Dankiw et al. (2021), Jean and Jun (2021), Scott et al. (2022), Biino et al. (2025), Squires et al. (2025), Stringer et al. (2025), Zhang et al. (2025), and Ozturk et al. (2025) whose study emphasized the benefits of outdoor play for holistic child development, particularly in enhancing cardiovascular fitness, motor skills, and cognitive, social, and emotional growth. While outdoor play encourages physical exploration and unstructured social interactions, which foster creativity and curiosity, indoor play offers environments for more focused and structured activities that could lead to more noticeable improvements in balance and stability.

Additionally, it was also discovered that there was a significant difference in the achievement of children's gross motor skills related to balance and stability when exposed to indoor and outdoor play sessions. This finding reflects the fact that that outdoor play sessions provide more varied and larger spaces for children to practice their balance and stability, leading to higher improvements in these gross motor skills compared to indoor play sessions. This finding is in line with the earlier studies of Ozturk et al. (2025), Zhang et al. (2025), Liu et al. (2025), Spring et al. (2025), and Wu et al. (2024) whose findings revealed the usefulness of exposing outdoor play given that it leads to increase in gross motor skills and cognitive development.

Further findings from this study show that children exposed to indoor play sessions demonstrated better spatial awareness and body control, as well as timing and rhythm, compared to those in outdoor play sessions. This could be attributed to the fact that indoor play environments often focus on activities that require controlled movements and fine-tuned motor skills. This finding aligns with Carr et al. (2017), Liu et al. (2025), Zhang et al. (2025), Wu et al. (2024), Cankaya et al. (2025), and Biino et al. (2025) whose studies noted that well-designed play environments contribute to improvements in executive functions such as flexibility, planning, and inhibitory control, which are crucial for tasks involving timing and body awareness. Similarly, indoor play may provide more opportunities for children to practice skills that require fine motor control, such as rhythmic movements or spatial tasks that involve direction and coordination. These structured activities might be beneficial in supporting the development of timing and rhythm, as they engage children in activities that require precise body movements.

Another important finding of this study is the fact that there was a significant difference in the scores of children's gross motor skills related to timing and rhythm when exposed to indoor and outdoor play. It was discovered that the outdoor play sessions demonstrated a higher mean score, suggesting a more significant impact on children's development of timing and rhythm. This finding falls in line with the

studies of Liu et al. (2025), Wu et al. (2024), Ozturk et al. (2025), Cankaya et al. (2025) and Biino et al. (2025) whose study revealed that play improves children's all-round development including cognitive abilities.

Despite the advantages of indoor play for certain aspects of motor skill development, the outdoor play sessions yielded higher gains in other areas, such as balance and stability. These results suggest that while both environments support different aspects of development, outdoor play's dynamic nature, with its larger spaces and unstructured activities, may better foster skills related to balance and spatial awareness. As Tri (2022) indicated, outdoor settings, through their rich physical environments, enhance cognitive and motor functions like critical thinking, flexibility, and balance, which may contribute to the improvements observed in the study. Therefore, while structured indoor play environments seem to promote the development of more specific skills such as spatial awareness and rhythm, the outdoor environment's variability and opportunities for free play may be more effective in supporting overall gross motor development, particularly in balance and coordination. Future research could explore how these two environments interact to provide complementary benefits, supporting a holistic approach to early childhood motor development.

CONCLUSION

The study found that both indoor and outdoor play led to significant improvements in children's gross motor skills, including physical strength, coordination, balance, stability, spatial awareness, body control, and timing. While both play settings showed positive effects, outdoor play generally resulted in greater improvements, with medium effect sizes ranging from 36% to 62.8%, highlighting its superior impact on motor skill development compared to indoor play. In conclusion, the study found that outdoor play sessions were more effective than indoor play sessions in enhancing children's gross motor skills, particularly in areas such as physical strength, coordination, balance, stability, and other motor abilities. The outdoor environment, with its larger spaces and opportunities for dynamic, unstructured play, facilitates the development of these skills by encouraging greater movement and exploration. These findings underscore the critical role of outdoor play in early childhood education, highlighting its importance not only in fostering physical development but also in supporting cognitive, social, and emotional growth. As such, it is essential to integrate outdoor play into educational programs to create well-rounded developmental experiences for children. Future research should explore how indoor and outdoor play can complement each other to provide a balanced approach to fostering children's motor skills and overall development.

Implications of Findings for Instructional Design

The findings of this study have some implications for instructional designers, policy makers and educational technologists involved in early childhood education who are interested in planning instructional activities in line with students' preferences and strengths. The findings of this study shows that outdoor play presents more opportunities to enhance children's gross motor skills as well as social, emotional and cognitive development and skills given its abilities to foster growth in all dimensions. As such, instructional designers are encouraged to incorporate elements of outdoor play into classroom instruction since it has proven to improve the gross motor skills of students. This finding holds so many promises for instructional designers involved in early childhood development to incorporate outdoor play due to the larger space and opportunities that facilitates the development of skills by encouraging greater movement and exploration. As students learn through outdoor activities, they tend to interact with one another, express themselves, compete and get involved in activities. The aforementioned attributes therefore foster their emotional, cognitive and social skills thus leading to enhanced performance. As a result, instructional designers must incorporate play into the educational contents in order to meet the various strengths, interest and preference of learners thus leading to adequate growth and development in all ramifications and, by extension, an increase in performance due to the all-round development of skills.

Limitations and Further Research Direction

The study has some limitations. First, the study was limited to a very small sample size which therefore means the generalizability of the findings may not be applicable in all circumstances. Thus, future study should take not of this lapse and expand the sample size to further validate this finding. Additionally, the finding of this is limited to a sample size of 3-5 years which may not apply to all other age groups as far as early childhood education is concerned. Hence, further studies should include other age groups in order to provide more evidence to support this finding. The study relies heavily on quantitative data collected amongst a very small age groups and this may not really give a true picture of the result. As a result, future studies should incorporate a mixed method that blends both quantitative and qualitative study that will enable the participants to be extensively studied and be observed which will add more explanation to the findings of the study.

Recommendations

Based on the findings of the study, it is recommended that schools and childcare centers design structured indoor play sessions to enhance children's physical strength, coordination, and balance. Indoor activities should focus on improving spatial awareness and body control through movement-based games and appropriate equipment. Rhythmic activities like dance or timed obstacle courses should be included to develop timing and rhythm. Additionally, a combination of indoor and outdoor activities should be implemented to support holistic gross motor development, utilizing the strengths of both environments

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