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# Sociocultural-based games enhancing manipulative movement skills in Indonesian kindergartens

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**ABSTRACT**

This study aims to analyze the influence of a sociocultural-based manipulative movement game model on the manipulative movement skills in children aged 5–6 years. A quasi-experimental design was employed, using a pretest-posttest control group approach. A total of 24 students were purposively selected with prior written consent from their parents or guardians. The experimental group (n = 12) consisted of students from TK Negeri 4 Yogyakarta, while the control group (n = 12) came from TK Negeri 11 Yogyakarta. The intervention involved a manipulative movement game model developed based on Vygotsky's sociocultural perspective, integrating four elements of physical literacy from the Australian Physical Literacy Framework: manipulative movement skills, confidence, collaboration, and rule comprehension. Manipulative movement skills were assessed using the ball skills subdomain of the Test of Gross Motor Development–3 (TGMD-3). Data were analyzed using the Mann–Whitney U test and the Wilcoxon rank-sum test. The results revealed significant differences between the pretest and posttest groups (W = 56.949, p = 0.04384) and between the control and experimental groups in the posttest (W = 44.807, p = 0.0004301). These findings indicate that the developed model effectively enhances children's manipulative movement skills. The study underscores the importance of integrating the principles of mediated learning, scaffolding, and the zone of proximal development into early childhood physical-motor learning. The implementation of this model is recommended as an alternative approach to physical-motor learning in Indonesian kindergartens.

**Keywords:** game, manipulative movement, sociocultural, TGMD-3

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## INTRODUCTION

Manipulative movement skills serve as a foundational competency for children's future participation in a diverse range of physical activities. These skills encompass throwing, catching, dribbling, kicking, and striking objects with implements (Sport Australia, 2019). Empirical evidence suggests that improving object control skills through early motor interventions can significantly support cognitive development, particularly executive functions, even though its impact on social development may be less pronounced (Capio et al., 2024). These findings highlight that the early childhood manipulative movement skill intervention is more effective in fostering cognitive growth than social.

The urgency of this developmental focus is further reinforced by Vygotsky's cognitive development theory. Learning within the Zone of Proximal Development (ZPD) can be optimized through purposeful, meaningful physical activity. Applying ZPD principles in physical education encourages more adaptive and guided teaching practices, aligning with children's developmental capacities (Wang & Zhang, 2022). In this context, teachers serve as social mediators, providing scaffolding that facilitates the acquisition of manipulative movement skills. These skills not only

contribute to physical development but also act as cognitive stimuli, cultivated through structured social interactions. Given their ontogenetic nature, requiring deliberate stimulation and guided practice (Goodway et al., 2021), the creation of intentional learning environments becomes imperative. Consequently, embedding manipulative movement skill instruction within early childhood curricula through a sociocultural lens represents a strategic approach to fostering comprehensive child development. In addition to sociocultural and environmental factors, psychological aspects such as goal setting and self-monitoring also play a critical role in the mastery of children's motor skills. Hidayat (2012) found that structured goal-setting activities and consistent self-monitoring significantly enhanced both motor-skill performance and intrinsic motivation among elementary school students. This finding reinforces the importance of empowering learners to take active control of their progress, aligning with Vygotsky's notion of mediated learning and scaffolding, where motivation and self-awareness become integral elements in the developmental process.

The development of children's movement skills is influenced by social and cultural factors. A study conducted in Iran (Mohammadi et al., 2023) found that children living in rural environments that support physical activity scored higher in both physical literacy and physical activity levels compared to children residing in suburban and urban areas. This evidence underscores the importance of considering sociocultural and ecological contexts in physical education. Prior research has shown that early childhood object control abilities vary by gender and cultural background. For instance, Indonesian boys demonstrated comparable catching and kicking skills to their American boys but significantly lagged in hitting and throwing abilities (Syafruddin et al., 2020). Conversely, Indonesian girls underperformed across all object control skill areas compared to American girls, except for kicking, in which they performed similarly (Syafruddin et al., 2020). These findings align with observed differences in object control skill levels between Indonesian boys and girls aged 5–6, highlighting the need for gender-sensitive and culturally responsive approaches in early childhood physical literacy education (Dilandes et al., 2022).

The development of manipulative movement skills in kindergarten settings remains suboptimal, primarily due to the limited availability of educators trained in physical education. In public kindergartens especially, physical-motor learning is often facilitated by general classroom teachers who may lack formal training in this domain. This gap in expertise leads to insufficient stimulation of children's gross motor development, including essential manipulative skills such as throwing, catching, and kicking. Given that physical-motor development is a core component of the Early Childhood Education Graduate Competency Standards (The Ministry of Education, 2022), this issue warrants urgent attention. Such an approach not only aligns with developmental theories but also promotes holistic child growth by integrating physical, cognitive, and social learning experiences.

One promising solution to address the underdevelopment of manipulative movement skills in early childhood education involves the creation and implementation of contextual, culturally relevant, and practical teaching resources. A particularly effective strategy is the development of a sociocultural-based manipulative movement game model. This model is specifically designed to support the acquisition of manipulative movement skills such as throwing, catching, dribbling, kicking, and striking by integrating gross motor development with meaningful social interaction, cultural values, and the foundational principles of physical literacy. This sociocultural approach aligns with Vygotsky's theory of cognitive development, emphasizing learning through social interaction, mediated learning, scaffolding, and the zone of proximal development (Cole et al., 1978). Picture books serve as a medium to introduce social interaction within the learning process of manipulative movement skills. These books are used in read-aloud sessions prior to game-based activities. Following the storytelling, teachers engage children in manipulative movement skill game that incorporates elements of Indonesian culture. Throughout the lesson, teachers aim to foster interaction among students and between students and teachers to build scaffolding that supports children's progression through their zone of proximal development. The manipulative movement skill game activities are designed with consideration for four core elements of physical

literacy: manipulative movement skills, self-confidence, collaboration, and understanding of rules (Sport Australia, 2019).

This study aimed to investigate the effect of a sociocultural-based manipulative movement game model on the development of manipulative movement skills in early childhood. The research was conducted with kindergarten students aged 5–6 years in Yogyakarta, Indonesia. The findings are anticipated to contribute to the existing empirical research on gross physical-motor learning in Indonesian kindergartens.

## METHOD

This study employed a quasi-experimental design to investigate the effect of a socioculturally grounded manipulative movement game model on the manipulative movement skills of children aged 5–6 years. The study involved 24 children from two kindergartens in Yogyakarta, Indonesia. The control group consisted of 12 students from TK Negeri 11, while the experimental group included 12 students from TK Negeri 4. All participants met the following inclusion criteria: (1) aged 5–6 years; (2) enrolled as active students in one of the participating kindergartens; (3) no history of medical conditions that would hinder participation in physical activities; and (4) obtained written parental or guardian consent to participate in the study. The instrument used to measure manipulative movement skills was the Test of Gross Motor Development – Third Edition, specifically the ball skills subtest (TGMD-3) (Goodway et al., 2021).

The control group did not receive any treatment. Their physical-motor learning followed the regular routine conducted by the classroom teacher, beginning with singing and body movements to rhythm and followed by simple ball-game activities.

The experimental group participated in a 12-session intervention, with each session lasting 150 minutes. The intervention consisted of a series of manipulative movement game model designed from a sociocultural perspective. The model incorporated five types of game, each focusing on a specific manipulative movement skill: (1) throwing, (2) catching, (3) dribbling, (4) kicking, and (5) striking with an implement. Each session was structured into four components: (1) opening (30 minutes), (2) core activity (60 minutes), (3) break (30 minutes), and (4) closing (30 minutes).

The opening activity introduced students to various manipulative movement skills and demonstrated how learning can happen through interactions with peers and more experienced individuals. This segment involved a shared reading of the picture book *Serunya Bermain Bola* (The Fun of Playing Ball) as a mediated learning experience.

The core activity provided opportunities for students to practice manipulative movement skills. Each session began with a warm-up, followed by games that allowed children to explore various ways of manipulating objects. These experiences were designed to help students build an understanding of game rules and develop confidence in performing physical movements. Group games were then introduced to promote collaborative skills. The types of games chosen are traditional or modified games known in Indonesia, enabling teachers to explore each child's zone of proximal development (ZPD) and offer appropriate scaffolding support. The core activity concluded with a cool-down session to help children relax their bodies.

The break period in the sociocultural-based manipulative movement game model serves a vital role in supporting both the physical and psychological well-being of young learners. During this time, children are encouraged to eat and drink together, fostering a sense of community and reinforcing social bonds. This communal activity is not merely a pause in the learning process but an intentional strategy to promote social interaction and emotional regulation—two key components of early childhood development. For example, sharing meals and engaging in informal conversations during breaks can help children practice turn-taking, empathy, and communication skills, which are foundational for collaborative play and group learning.

Following the break, the session transitions into a structured reflection activity guided by the teacher. This reflective phase is crucial for consolidating learning and encouraging metacognitive awareness in young children. Through guided discussions, children are prompted

to think about their experiences during the manipulative movement games, such as how they felt when successfully catching a ball or how they worked together with peers during a kicking game. These reflections help children recognize their progress in building self-confidence, understand the importance of teamwork, and internalize the rules of the games they played.

The relevance of this approach lies in its alignment with Vygotsky's sociocultural theory, particularly the concepts of mediated learning and the Zone of Proximal Development (ZPD). By reflecting on their experiences with the support of a teacher, children are scaffolded to articulate their learning, which enhances both cognitive and emotional development. For instance, a child who initially struggled with dribbling may, through reflection and teacher feedback, become aware of their improvement and feel motivated to continue practicing. This process not only reinforces skill acquisition but also nurtures a growth mindset.

Moreover, the inclusion of culturally familiar games and narratives during the sessions ensures that learning is meaningful and contextually relevant. When children engage in traditional Indonesian games such as "*Gobak Sodor*" or "*Bentengan*," they are not only developing motor skills but also connecting with their cultural heritage. This cultural grounding enhances engagement and provides a sense of identity and belonging, which are essential for holistic development.

In summary, the break and reflection components of the sociocultural-based manipulative movement game model are not ancillary but integral to its effectiveness. They provide opportunities for rest, socialization, emotional regulation, and cognitive consolidation. By embedding these elements into the learning structure, the model supports a comprehensive approach to early childhood education, one that values physical literacy, cultural relevance, and the social-emotional dimensions of learning.

## FINDINGS AND DISCUSSION

### Findings

#### *TGMD-3 pretest and posttest ball skills subtest*

In the initial phase, students' manipulative movement skills were assessed using the Ball Skills subtest of the TGMD-3 instrument. The pretest data for each skill (K) in the control group are presented in Table 1.

**Table 1. Control group pretest data**

| No. | Skill | Mean | SD | Median | Skew | Kurtosis | SE |
|---|---|---|---|---|---|---|---|
| 1. | K1 | 1.332 | 0.658 | 1.3 | -0.252 | -1.395 | 0.19 |
| 2. | K2 | 1.272 | 0.492 | 1.25 | -1.218 | 1.29 | 0.14 |
| 3. | K3 | 1.307 | 0.753 | 1.17 | -0.88 | 0.51 | 0.22 |
| 4. | K4 | 1.083 | 0.63 | 1 | -0.403 | -0.753 | 0.18 |
| 5. | K5 | 1.375 | 0.57 | 1.5 | -0.303 | -1.223 | 0.165 |
| 6. | K6 | 0.982 | 0.825 | 1 | 0.045 | -1.24 | 0.237 |
| 7. | K7 | 0.873 | 0.812 | 1 | 0.0725 | -1.743 | 0.235 |

Given the relatively small sample size of 24 participants (n = 24), the normal assumption was not met. Therefore, a non-parametric statistical test was employed instead of the independent samples t-test. The Wilcoxon Rank-Sum Test was considered appropriate for detecting location shifts in median values between groups. Before analyzing posttest differences between the control and experimental groups, it was necessary to confirm that there were significant median differences in the pretest scores, particularly with respect to their central tendency. With an experimental data sample size of n=24, the median value, skewness (distribution slope), and kurtosis (distribution peak sensitivity level) were analyzed. The skewness value describes the level of asymmetry of the data distribution, while the kurtosis value provides information about the peak or flatness of the distribution, especially in pretest data. In this context, the median is considered more representative than the mean because it is not affected by outliers. In contrast, the mean can be affected by extreme values, such as maximum and minimum values.

When comparing the median values from Tables 1 and 2, it becomes evident that several manipulative movement skills showed notable improvement following the implementation of the sociocultural-based movement game model. Specifically, the skills that demonstrated measurable progress included the one-handed dribble of a stationary ball (K3), two-handed catch (K4), overhand throw (K6), and underhand throw (K7).

**Table 2. Experiment group posttest description**

| No. | Skill | Mean | SD | Median | Skew | Kurtosis | SE |
|---|---|---|---|---|---|---|---|
| 1. | K1 | 1.116 | 0.556 | 1.2 | -0.146 | 1.462 | 0.16 |
| 2. | K2 | 1.168 | 0.645 | 1 | -0.5425 | 0.93 | 0.185 |
| 3. | K3 | 1.417 | 0.846 | 2 | -0.953 | -0.39 | 0.247 |
| 4. | K4 | 1.61 | 0.513 | 1.67 | -0.805 | -0.8 | 0.15 |
| 5. | K5 | 1.29 | 0.793 | 1.5 | -0.807 | 0.5275 | 0.23 |
| 6. | K6 | 1.395 | 0.487 | 1.5 | -0.5375 | 0.74 | 0.14 |
| 7. | K7 | 1.373 | 0.52 | 1.5 | -0.24 | -0.81 | 0.15 |

Skill Key: K1: Two-handed strike of a stationary ball; K2: One-handed forehand strike of a self-bouncing ball; K3: One-handed dribble of a stationary ball; K4: Two-handed catch; K5: Kick of a stationary ball; K6: Overhand throw; K7: Underhand throw

These skills are essential components of early childhood motor development, requiring coordination, timing, and confidence in object control. The Mann–Whitney U test confirmed statistically significant differences in posttest scores between the control and experimental groups, validating the effectiveness of the intervention. For instance, the improvement in catching and throwing skills suggests that children benefited from repeated, scaffolded practice within a socially interactive and culturally familiar learning environment. However, not all students showed equal progress, indicating that factors such as attendance consistency, engagement levels, or individual developmental differences may have influenced outcomes.

The relevance of these findings lies in their support for Vygotsky's sociocultural theory, which emphasizes the role of social interaction and guided learning within the Zone of Proximal Development (ZPD). The game model's structure, incorporating storytelling, traditional games, and collaborative play, provided a rich context for mediated learning, allowing children to internalize movement concepts through meaningful experiences. For example, using culturally familiar games like "Gobak Sodor" or "Bentengan" not only enhanced motor skill acquisition but also reinforced cultural identity and social values. Moreover, the integration of reflection activities helped children recognize their progress, boosting self-confidence and encouraging metacognitive awareness. These elements collectively contributed to a holistic learning experience that addressed physical, cognitive, and emotional development. The study's results underscore the importance of designing early childhood physical education programs that are not only skill-focused but also culturally responsive and socially engaging.

***Hypothesis testing***

*Baseline equivalence testing (Pre-test)*

A Mann-Whitney U test (Wilcoxon rank-sum test) was conducted to assess the baseline equivalence of the control and experimental groups prior to the intervention. The analysis compared the pre-test scores of both groups to determine if they originated from populations with the same distribution. The results indicated a statistically significant difference at the baseline (W = 56949, *p* = .04384). This significant pre-test difference reveals that the groups were not equivalent in terms of manipulative movement skills before the study began. This is a methodological limitation, as it introduces a potential confounding variable. To account for this initial disparity, the primary analysis correctly focuses on the change or the post-test difference between the groups, rather than a direct comparison of post-test scores alone.

*Post-test comparison and treatment effect*

A second Mann-Whitney U test was performed on the post-test data to evaluate the effect of the intervention after accounting for the baseline difference. The test revealed a statistically significant and substantially larger difference between the control and experimental groups (W = 44807, *p* < .001). The marked significance in the post-test comparison, despite the initial group inequality, provides strong evidence for the efficacy of the intervention. The sociocultural-based game model administered to the experimental group is the most possible explanation for the pronounced divergence in their post-test performance compared to the control group. This confirms that the treatment had a significant positive effect on manipulative movement skills.

***Evidence of treatment effects***

A Wilcoxon rank-sum test was conducted to evaluate the effect of the intervention on manipulative movement skills by comparing the post-test scores of the experimental group (which received the sociocultural-based game model) and the control group. The results revealed a statistically significant difference between the two groups (W = 44807, p = .00043).

Since the p-value is substantially less than the conventional alpha level of .05, the null hypothesis, which stated that there was no difference in the post-test scores of the two groups, is rejected. This provides strong statistical evidence to support the alternative hypothesis ($H_a$), confirming that the observed difference in location (i.e., the central tendency of the scores) is not equal to zero. Therefore, it is concluded that the sociocultural-based manipulative movement skill game model had a significant and positive treatment effect, successfully improving students' manipulative movement skills compared to the control condition.

The pretest and posttest data reveal a statistically significant difference between the control and experimental groups, validating the use of an independent two-sample design. This distinction confirms that the groups were not equivalent at baseline and that the intervention had a measurable impact. Specifically, the experimental group demonstrated higher posttest scores, indicating that the sociocultural-based manipulative movement game model effectively enhanced children's manipulative movement skills. These skills, such as throwing, catching, dribbling, and striking, are foundational for physical literacy and future participation in sports and recreational activities. The structured intervention, which incorporated culturally familiar games and scaffolded learning experiences, provided children with repeated opportunities to practice and refine these skills in a socially engaging environment. For example, activities like “Gobak Sodor” and “Bentengan” not only encouraged physical coordination but also fostered teamwork and rule comprehension, aligning with the principles of the Australian Physical Literacy Framework.

The relevance of these findings extends beyond statistical validation; they highlight the pedagogical value of integrating sociocultural elements into early childhood physical education. The model’s success suggests that culturally responsive teaching strategies can significantly improve motor skill acquisition, especially when combined with mediated learning and scaffolding techniques rooted in Vygotsky’s theory. Moreover, the data implies that with a larger sample size, improvements would likely be observed in additional skills such as the two-handed strike of a stationary ball, one-handed forehand strike of a self-bouncing ball, and kicking a stationary ball, skills that showed potential but did not reach statistical significance in this study. This opens up avenues for future research to explore the model’s broader applicability in various cultural settings and larger populations. Ultimately, the study underscores the importance of designing early childhood curricula that are not only developmentally appropriate but also culturally meaningful, thereby promoting holistic growth in physical, cognitive, and social domains.

**Discussion**

The results of this study indicate that the implementation of a sociocultural-based manipulative movement game model significantly enhances the manipulative movement skills of children aged 5–6 years in a kindergarten setting. This improvement was most notably reflected in the significant differences in posttest scores between the experimental and control groups. These findings provide empirical support for the sociocultural learning theory developed by

Vygotsky, which highlights the importance of learning within a social context through scaffolding and the zone of proximal development (ZPD) (Vygotsky in Cole et al., 1978; Wang & Zhang, 2022).

Statistically, the Mann-Whitney U test revealed significant differences both between the pretest and posttest groups and between the experimental and control groups at the posttest stage ($p < 0.05$). These results reinforce the argument that the developed game model is content-relevant and effective in practical implementation. The model is grounded in a contextual learning approach that incorporates local cultural elements and integrates the four key components of physical literacy outlined in the Australian Physical Literacy Framework: motor skills, confidence, collaboration, and understanding of rules (Sport Australia, 2019).

Analysis revealed that the most significant gains occurred within the ball skills subdomain of the TGMD-3, particularly in the one-handed stationary dribble (K3), two-handed catch (K4), overhead throw (K6), and underhand throw (K7). These skills are foundational, relying heavily on hand-eye coordination, dynamic stability, and a child's perceived competence in manipulating objects. The observed progress is likely a direct result of the program's carefully sequenced session structure. The phased approach, moving from a warm-up (opening) to focused gameplay (core), a mental reset (break), and a reflective conclusion (closing), framed skill acquisition not as an isolated drill but as an integral part of a social ritual. This framing made the learning process more meaningful and socially rewarding, which in turn boosted engagement, reduced anxiety, and fostered the confidence necessary for skill mastery (Bai et al., 2024; De Sauza et al., 2023).

A notable feature of this model is the use of picture storybooks in read-aloud sessions as a transitional medium between symbolic experiences (narratives) and motor experiences (game). This strategy supports the idea that mediated learning experiences can expand children's understanding of movement concepts and enhance their cognitive abilities in motor learning contexts (Feuerstein et al., 1980). In this process, teachers act as mediators, providing scaffolding to help children reach skills within their ZPD. This is consistent with Vygotsky's view that optimal development occurs when learning is facilitated in a meaningful and supportive social environment.

Furthermore, the core activities in this model are designed to explore manipulative skills through traditional games or adaptations of local cultural games. This approach aligns with findings by Mohammadi et al. (2023), which establish that a child's cultural environment significantly shapes their physical literacy; children from communities with rich traditions of physical play consistently demonstrate more advanced motor competencies. In the Indonesian context, this connection is particularly powerful. Games such as *bakiak* (cooperative wooden clogs) or *engklek* (hopscotch) do more than teach balance, coordination, and object control. By engaging in these shared cultural practices, children unconsciously absorb social values like cooperation, turn-taking, and respect for rules. Consequently, this method offers a holistic educational benefit: it simultaneously accelerates fundamental movement development and reinforces a child's cultural identity, weaving individual growth into the broader fabric of community heritage.

Overall, the model supports not just the mechanical development of motor skills, but also the affective and social dimensions of learning, such as confidence and the ability to collaborate. As described in the physical literacy framework, strong motor competence cannot be separated from confidence and the willingness to participate in social physical activities (Sport Australia, 2019). Children in the experimental group showed increased confidence in trying new skills and demonstrated improved teamwork in group play. These results are consistent with the findings of Capio et al. (2024), which highlight the link between mastery of motor skills and the development of executive functions, including decision-making and self-regulation.

Nevertheless, it is important to recognize that not all children demonstrated significant improvement in their manipulative movement skills following the intervention. The data revealed that several participants showed minimal progress, suggesting that the effectiveness of the sociocultural-based game model may vary depending on individual circumstances. One key factor identified was inconsistent attendance; children who missed multiple sessions were less likely to benefit fully from the structured learning experiences. For example, a child who missed sessions

focused on catching and throwing may not have had sufficient exposure to scaffolded practice, limiting their skill development. Additionally, varying levels of interest in physical activity among children could have influenced engagement and motivation, which are critical for motor learning. Some children may have been more inclined toward sedentary play or lacked enthusiasm for group-based physical tasks, thereby reducing the impact of the intervention (Barnet et al, 2025; McDonough et al., 2020).

This variability in outcomes highlights the need for further investigation into the contextual and personal factors that influence children's responsiveness to physical-motor interventions. Parental support, for instance, plays a crucial role in reinforcing learning outside the classroom. Children whose parents encourage active play at home may experience more consistent skill reinforcement, while those without such support may struggle to retain and apply what they learn. Health conditions, such as motor coordination difficulties or sensory sensitivities, could also affect a child's ability to participate fully in movement-based activities. Understanding these factors is essential for refining the model and ensuring its inclusivity. Future iterations of the program might incorporate differentiated instruction, flexible scheduling, or additional support mechanisms to accommodate diverse learner needs. By addressing these challenges, educators can enhance the model's effectiveness and ensure that all children regardless of background or ability have the opportunity to develop essential manipulative movement skills (Flynn et al., 2023; He et al., 2024).

These findings carry significant implications for the advancement of physical education practices in early childhood settings. First, the sociocultural-based approach demonstrated empirical effectiveness in enhancing manipulative movement skills, particularly when implemented through contextually grounded strategies that incorporate local cultural values and children's social environments. By embedding traditional games and culturally familiar narratives into physical-motor learning, educators can create meaningful and engaging experiences that resonate with children lived realities. This approach not only facilitates skill acquisition but also fosters a sense of identity and belonging, which are essential for holistic development. For example, integrating games such as *Gobak Sodor* or *Bentengan* enables children to practice object control skills within a familiar social framework, thereby reinforcing both motor competence and cultural relevance. This finding is consistent with the work of Sutapa and Suharjana (2020), who demonstrated that kinaesthetic and contemporary-based physical activities can substantially improve gross motor competence in early childhood. Their study emphasized that structured physical movements, integrated with rhythmic and contextualized learning, support not only physical coordination but also cognitive and affective growth. The present study extends this perspective by showing that incorporating sociocultural values and traditional games further enhances the authenticity and engagement of motor-skill learning experiences in Indonesian kindergarten contexts

Second, the study underscores the urgent need for targeted professional development among kindergarten educators, especially those lacking formal training in physical education. Equipping teachers with foundational knowledge of physical literacy, including its core components of motor skills, confidence, collaboration, and rule comprehension, can significantly enhance instructional quality and learning outcomes. The game-based model developed in this research offers a replicable and adaptable framework that can be tailored to diverse regional and cultural contexts across Indonesia. Its success suggests that early childhood physical education should move beyond generic motor activities and embrace integrative, culturally responsive pedagogies. Such innovations are critical for aligning classroom practices with national competency standards and for promoting equitable access to quality physical-motor education in early childhood institutions (Suryadi et al., 2023).

Moreover, the study highlights the urgency of strengthening early childhood education policies and curricula to provide greater emphasis on the development of gross motor skills through integrative and contextual approaches. Many early childhood education institutions still overlook the role of physical education due to limited human resources and inadequate facilities. Yet, motor skills development is part of the Early Childhood Education Graduate Competency

Standards established by the Ministry of Education (Permendikbudristek, 2022) and should be addressed proportionally alongside cognitive and socio-emotional aspects.

Moreover, the study highlights the urgency of strengthening early childhood education policies and curricula to place greater emphasis on the development of gross motor skills through integrative and contextually grounded approaches. Despite the inclusion of motor development in the Early Childhood Education Graduate Competency Standards (Permendikbudristek, 2022), many institutions continue to overlook its importance due to limited human resources and inadequate facilities. This gap is particularly evident in public kindergartens, where physical education is often delivered by generalist teachers lacking formal training in motor skill instruction. As a result, children may not receive sufficient stimulation in essential manipulative skills such as throwing, catching, and kicking, skills that are foundational to physical literacy and overall developmental readiness. Addressing this issue requires not only policy reform but also strategic investment in teacher training, infrastructure, and culturally relevant learning materials.

From a methodological standpoint, the study's use of a quasi-experimental design combined with non-parametric statistical tests represents a strength, particularly given the small sample size and non-normal data distribution. The Wilcoxon and Mann–Whitney U tests provided robust insights into median score differences between groups, while analyses of skewness and kurtosis offered a deeper understanding of data distribution characteristics. These methodological choices ensured the reliability of the findings and reinforced the validity of the intervention's impact. However, the study's limitations, most notably the small sample size (n = 24), necessitate cautious interpretation and underscore the need for future research involving larger, more diverse populations. Additionally, the long-term sustainability of the intervention's effects remains unexplored. Longitudinal studies are recommended to assess whether improvements in manipulative movement skills persist over time and contribute to broader developmental outcomes. Overall, the sociocultural-based manipulative movement game model presents a promising pedagogical innovation that aligns with national standards and supports holistic child development in early childhood education.

## CONCLUSION

This study concludes that the sociocultural-based manipulative movement model is significantly effective in improving manipulative movement skills in early childhood. The implementation of this model, grounded in Vygotsky's theoretical concepts of mediated learning, scaffolding, and the zone of proximal development (ZPD), has been shown to support the development of skills such as dribbling, catching, and throwing. The significant post-test score differences between the experimental and control groups indicate that the model offers a meaningful, adaptive, and developmentally appropriate learning environment. The integration of sociocultural elements into learning activities, such as storybooks, traditional games, and small-group social interaction, also fosters self-confidence, collaboration, and an understanding of game rules. This approach not only supports children's motor development but also promotes their cognitive and socio-emotional growth holistically. Therefore, the sociocultural-based manipulative movement game model is recommended as an alternative instructional strategy for physical-motor learning in Indonesian kindergartens. The implementation of this model requires teacher training, provision of culturally relevant learning materials, and supportive curriculum policies that prioritize early childhood physical literacy. Future research involving larger samples and longitudinal designs is recommended to explore the long-term impact of this model on children's overall development.

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