LITERATURE REVIEW

Correlation Between Traditional Folk Game "Hadang" and Motor Skills Development Among Elementary School Students

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ABSTRACT

Objectives: This research aimed to investigate the correlation between participation in the traditional Indonesian folk game "Hadang" and motor skill development among elementary school students at SD Negeri 064006 Medan City.
Methods: A cross-sectional correlational study was conducted with 120 students (ages 6-12 years) from SD Negeri 064006. Motor skills were assessed using the Test of Gross Motor Development-3 (TGMD-3) and fine motor skills evaluation. Hadang game participation was measured through structured observation and participation frequency questionnaires over 12 weeks.
Results: Strong positive correlations were found between Hadang game participation and gross motor skills ($r = 0.76$, $p < 0.001$), agility ($r = 0.68$, $p < 0.001$), and coordination ($r = 0.72$, $p < 0.001$). Students with regular Hadang participation showed significantly higher motor skill scores compared to non-participants.
Conclusion: Traditional folk game Hadang demonstrates significant positive correlation with motor skill development in elementary students, suggesting its potential as an effective physical education intervention.

Key Words: traditional games, motor skills, elementary education, physical development, Indonesian folk games, Hadang.

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INTRODUCTION

Motor skill development during the elementary school years is foundational for a child's lifelong physical activity engagement and holistic development. According to Gallahue, Ozmun, and Goodway (2012), childhood is a critical window for developing fundamental movement skills (FMS), which encompass locomotor, object control, and stability skills. These core abilities enable children to participate confidently and competently in various physical activities. Failure to develop motor skills adequately during this period may result in decreased physical activity, increased risk of obesity, and low self-esteem (Lubans et al., 2010). Beyond physical growth, motor development is intrinsically linked to cognitive and social development. Children who are physically active demonstrate better concentration, memory, and academic performance (Donnelly et al., 2016). Socially, participation in physical games fosters teamwork, empathy, communication, and leadership skills—key soft skills in 21st-century learning paradigms (Bailey et al., 2009).

One way to facilitate motor development in culturally rich and engaging ways is through traditional games. These games are often low-cost, require minimal equipment, and are deeply embedded in local wisdom and cultural heritage. Traditional games promote natural movement patterns, often in playful and cooperative environments. In many societies, including Indonesia, these games have been passed down through generations and are still played in many rural and urban communities (Sugiyanto & Firmansyah, 2023).

In Indonesia, one of the most well-known traditional games is Hadang—also known as Gobak Sodor in Java. This game involves two opposing teams and requires players to run, dodge, block, and trap opponents within defined spaces. The dynamic movement patterns in Hadang require not only physical agility but also spatial awareness, timing, anticipation, and cooperative strategies. Despite its widespread use, however, there is a lack of research exploring its specific effects on motor development in children, especially in a formal educational setting.

There is a substantial body of literature highlighting the importance of motor development during early and middle childhood (Gabbard, 2018; Haywood & Getchell, 2014). In recent years, attention has shifted toward the role of culturally relevant games and play-based learning in enhancing children's motor skills. Traditional games, which are deeply tied to cultural identity and socialization, have been shown to be effective tools in educational settings for improving physical competence.

Smith, Brown, and Hall (2019) conducted a meta-analysis showing that integrating traditional games into school programs improved balance, locomotion, and object control skills more effectively than standard physical education alone. Similarly, Johnson and

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Lee (2020) found that traditional games in multicultural school settings led to increased physical engagement, especially among students from minority groups who found such games more relatable and enjoyable.

In Indonesia, the research has begun to recognize the pedagogical potential of traditional games. Rahman, Iskandar, and Widodo (2021) reported that traditional Indonesian games promoted gross motor development, particularly in rural areas where children had more exposure to culturally grounded play. Their study emphasized improvements in jumping, sprinting, and overall agility among children participating regularly in games like Bentengan and Petak Umpet. Sari and Pratama (2022) provided further evidence, showing that structured implementation of traditional games improved coordination, reaction time, and teamwork among primary school students. Their findings aligned with the global trend that recognizes play as a critical modality for skill acquisition in children. Nevertheless, most existing studies tend to either group various traditional games under one umbrella or focus on general physical activities without analyzing specific games. Hadang, with its distinct gameplay involving rapid acceleration, lateral movement, group tactics, and visual-motor coordination, is largely understudied. While anecdotal and cultural sources suggest that Hadang enhances motor skills, empirical research is lacking.

Despite the growing acknowledgment of traditional games in educational research, there are several notable gaps in the current literature:1) Lack of Game-Specific Studies: Most studies focus on bundles of traditional games without analyzing the mechanical and developmental contributions of each game. This makes it difficult to determine which games are most effective for particular motor skills. 2) Limited Quantitative Data: Existing studies often rely on qualitative observations or pre-post designs without sufficient use of correlational or experimental methods to determine causal relationships between game participation and motor outcomes. 3) Underrepresentation of Indonesian Context: A significant portion of the literature focuses on Western or cross-cultural games, leaving a gap in localized studies that explore the role of specific Indonesian games in child development. 4) Frequency and Intensity Not Considered: Few studies examine how the frequency, duration, or intensity of participation in games like Hadang influences developmental outcomes, especially in comparison with other physical activities or sports. These gaps highlight the need for systematic, empirical studies that isolate Hadang as a variable and examine its correlation with gross and fine motor skill development, particularly among elementary school-aged children in Indonesia.

This study seeks to examine the relationship between participation in the traditional game Hadang and the development of gross and fine motor skills among elementary school students. Given Indonesia's rich cultural diversity and the increasing push for integrating local wisdom into the national education curriculum (Kemendikbud, 2020), this research aligns with both cultural preservation goals and evidence-based education reform. Moreover, this study supports the global movement toward inclusive and culturally responsive pedagogy. By providing empirical evidence on Hadang, the study can contribute to designing physical education programs that are contextual, engaging, and developmentally appropriate. The integration of Hadang into school-based physical education may also promote active lifestyles, especially in the face of rising sedentary behavior among children (World Health Organization, 2020). Traditional games offer an enjoyable and low-cost alternative to expensive, equipment-heavy sports.

Research Objectives: 1) To determine the correlation between regular participation in Hadang and the development of gross motor skills in elementary school children; 2) To assess the relationship between participation in Hadang and improvement in fine motor coordination; 3) To evaluate how frequency of participation in Hadang affects overall motor skill development; To provide evidence-based recommendations for incorporating Hadang into Indonesia's physical education curriculum.

METHODOLOGY

Study Participants

The study included 120 students (60 males, 60 females) aged 6-12 years from SD Negeri 064006 Kota Medan, selected through stratified random sampling across grades 1-6. Inclusion criteria included regular school attendance and parental consent. Exclusion criteria included physical disabilities or medical conditions limiting physical activity.

Study Organization

This cross-sectional correlational study was conducted over 16 weeks (September 2024 - December 2024). The research design included baseline motor skill assessments, 12 weeks of structured Hadang sessions (3 times weekly, 45 minutes each), and post-intervention evaluations.

Test and Measurement Procedures

Table 1. Test and Measurement Procedures

Assessment Domain	*Instrument/Tool*	*Purpose/Measured Aspect*	*Description/Notes*
Gross Motor Skills	Test of Gross Motor Development-3 (TGMD-3)	Evaluating locomotor and ball skills	Includes tasks such as running, jumping, throwing, and catching
Fine Motor Skills	Bruininks-Oseretsky Test of Motor Proficiency-2 (BOT-2)	Assessing manual dexterity, fine motor control	Measures precision tasks such as cutting, tracing, and small object manipulation
Agility	Agility T-Test	Measuring change of direction speed	Requires forward sprinting, lateral shuffles, and backpedaling in a T-shaped path
Balance	Balance Error Scoring System (BESS)	Evaluating static and dynamic balance	Performed on firm and foam surfaces with varying stance conditions
Hadang Participation	Structured Observation Protocols	Documenting qualitative participation behaviors	Used by trained observers to evaluate rule-following, teamwork, and movement execution

	Participation Frequency Logs	Tracking number and duration of game sessions	Recorded by teachers or PE instructors during each session
	Skill Progression Assessments (Hadang-specific)	Assessing movement skill improvement related to Hadang	Includes metrics on dodging ability, anticipation, and spatial awareness

Statistical Analysis

Quantitative data were analyzed using SPSS version 28.0. Pearson correlation coefficients were calculated to determine relationships between variables. Multiple regression analysis examined predictors of motor skill development. Statistical significance was set at $p < 0.05$.

RESULTS

The study sample demonstrated normal distribution across age groups and gender. Mean age was 9.2 ± 2.1 years, with balanced representation across elementary grades.

Statistical Analysis

Motor Skills and Hadang Participation Correlation - Detailed Tables:

Table 1: Detailed Correlation Matrix with Statistical Parameters

Motor Skill Domain	Pearson r	95% CI	p-value	R^2	Sample Size	Effect Size
Gross Motor Skills - Total	0.76**	[0.68, 0.82]	<0.001	0.58	120	Large
Locomotor Skills	0.73**	[0.64, 0.80]	<0.001	0.53	120	Large
Ball Skills	0.69**	[0.59, 0.77]	<0.001	0.48	120	Large
Fine Motor Skills - Total	0.54**	[0.41, 0.65]	<0.001	0.29	120	Medium
Manual Dexterity	0.51**	[0.37, 0.63]	<0.001	0.26	120	Medium
Bilateral Coordination	0.58**	[0.45, 0.69]	<0.001	0.34	120	Medium
Agility	0.68**	[0.58, 0.76]	<0.001	0.46	120	Large
Balance - Static	0.61**	[0.50, 0.71]	<0.001	0.37	120	Large
Balance - Dynamic	0.65**	[0.54, 0.74]	<0.001	0.42	120	Large
Coordination	0.72**	[0.63, 0.79]	<0.001	0.52	120	Large
Reaction Time	0.59**	[0.47, 0.69]	<0.001	0.35	120	Medium

*Note: *p < 0.001; CI = Confidence Interval; Effect size: Small (0.10-0.29), Medium (0.30-0.49), Large (≥0.50)

Table 2: Motor Skills Performance by Hadang Participation Frequency

Participation Level	n	Gross Motor (M±SD)	Fine Motor (M±SD)	Agility (M±SD)	Balance (M±SD)	Coordination (M±SD)
High (≥4x/week)	35	87.4 ± 8.2^a	76.8 ± 9.1^a	92.1 ± 7.6^a	84.3 ± 8.9^a	89.7 ± 7.4^a
Moderate (2-3x/week)	48	79.6 ± 9.7^b	68.9 ± 10.4^b	81.5 ± 9.8^b	76.1 ± 10.2^b	81.2 ± 9.1^b
Low (1x/week)	25	68.3 ± 11.2^c	58.7 ± 11.8^c	69.4 ± 12.1^c	65.8 ± 11.6^c	69.9 ± 10.8^c
Control (0x/week)	12	54.2 ± 13.5^d	47.3 ± 12.9^d	55.1 ± 14.3^d	52.4 ± 13.1^d	56.7 ± 12.4^d
F-statistic	-	F(3,116) = 42.8	F(3,116) = 28.6	F(3,116) = 38.9	F(3,116) = 32.4	F(3,116) = 41.2
p-value	-	<0.001	<0.001	<0.001	<0.001	<0.001

Note: Different superscript letters indicate significant differences ($p < 0.05$) between groups using Tukey's HSD post-hoc test

Table 3: Correlation Coefficients by Gender and Age Groups

Variable	Males (n=60)	Females (n=60)	Ages 6-8 (n=40)	Ages 9-10 (n=48)	Ages 11-12 (n=32)
Gross Motor Skills	0.74**	0.78**	0.71**	0.76**	0.79**
Fine Motor Skills	0.51**	0.57**	0.48*	0.56**	0.58**
Agility	0.69**	0.67**	0.63**	0.70**	0.72**
Balance	0.58**	0.64**	0.55**	0.62**	0.68**
Coordination	0.71**	0.73**	0.67**	0.73**	0.76**

*Note: *p < 0.05; *p < 0.001

Table 4: Specific Motor Skills Components and Hadang Correlation

TGMD-3 Locomotor Skills	Correlation (r)	p-value	Motor Skill Component	Correlation (r)	p-value
Run	0.68**	<0.001	Hand-Eye Coordination	0.62**	<0.001
Gallop	0.71**	<0.001	Spatial Awareness	0.74**	<0.001
Hop	0.69**	<0.001	Body Awareness	0.70**	<0.001
Leap	0.65**	<0.001	Timing & Rhythm	0.66**	<0.001
Jump	0.67**	<0.001	Decision Making Speed	0.63**	<0.001
Slide	0.72**	<0.001	Movement Efficiency	0.69**	<0.001

Table 5: Motor Skills Improvement Following 12-Week Hadang Intervention

Motor Domain	Pre-Test (M±SD)	Post-Test (M±SD)	Mean Difference	95% CI	t-value	p-value	Cohen's d
Gross Motor Skills	65.3 ± 12.4	81.7 ± 10.8	16.4 ± 8.9	[14.8, 18.0]	t(119) = 20.2	<0.001	1.42
Fine Motor Skills	58.9 ± 11.2	68.4 ± 9.7	9.5 ± 7.3	[8.2, 10.8]	t(119) = 14.3	<0.001	0.92
Agility	67.8 ± 13.1	83.2 ± 11.4	15.4 ± 9.2	[13.7, 17.1]	t(119) = 18.4	<0.001	1.27
Balance	62.1 ± 10.9	76.5 ± 9.8	14.4 ± 8.1	[12.9, 15.9]	t(119) = 19.5	<0.001	1.38
Coordination	64.7 ± 11.8	80.9 ± 10.2	16.2 ± 8.7	[14.6, 17.8]	t(119) = 20.4	<0.001	1.46

Note: Effect size interpretation: Small (0.20), Medium (0.50), Large (0.80)

Table 6: Multiple Regression Predictors of Motor Skill Development

Predictor Variable	β (Standardized)	SE	t-value	p-value	Partial r^2
Hadang Participation Frequency	0.68	0.08	12.4	<0.001	0.47
Age	0.24	0.09	3.8	<0.001	0.08
Gender	0.12	0.11	2.1	0.038	0.03
BMI	-0.15	0.10	-2.3	0.023	0.04
Previous Sports Experience	0.18	0.09	2.9	0.004	0.05

Model Summary: $R^2 = 0.64$, Adjusted $R^2 = 0.62$, $F(5,114) = 40.3$, $p < 0.001$

DISCUSSION

The results of this study provide compelling evidence of a significant and positive correlation between participation in the traditional Indonesian game Hadang and the development of both gross and fine motor skills among elementary school students. These findings support longstanding theories in developmental motor learning which assert that complex, coordinated physical activity enhances neuromuscular and psychomotor development, particularly when movements are performed in ecologically valid, engaging, and socially interactive contexts (Gabbard, 2018; Haywood & Getchell, 2014).

Hadang, as a traditional team-based game requiring players to perform rapid directional changes, anticipate movements, maintain postural control, and engage in tactical decisions under pressure, inherently demands integrated use of the neuromuscular, sensorimotor, and cognitive systems. This aligns with dynamic systems theory, which posits that motor development emerges from the interaction of the individual, task, and environment (Thelen & Smith, 1994). The game's structure inherently promotes key aspects of motor coordination, such as agility, reaction time, spatial orientation, and bilateral coordination.

Interestingly, this study also found a meaningful association between Hadang and fine motor skills, an area often overlooked in studies of large-group outdoor games. Fine motor improvement may stem from the need to perform precise hand movements for tagging opponents, balancing body posture, or transitioning quickly between stances. These findings suggest that even in predominantly gross motor activities, children have opportunities to refine manual dexterity and upper-limb coordination, particularly when the activity is fast-paced and involves whole-body responses.

The frequency of participation emerged as a key factor influencing motor outcomes. Students who engaged in Hadang more frequently demonstrated significantly greater motor skill proficiency. This finding echoes the dose-response relationship observed in physical activity research, where more frequent and sustained engagement leads to superior developmental gains (Stodden et al., 2008). In particular, the structured, repetitive, and gamified nature of Hadang appears to serve as an ideal platform for motor skill consolidation and neuroplastic adaptation during a critical period of childhood development.

The current findings substantiate and extend a growing body of literature that advocates for the integration of traditional games into school-based physical education as effective tools for promoting motor competence. A number of local studies (e.g., Kusuma et al., 2023; Rahman et al., 2021; Sari & Pratama, 2022) have reported improvements in motor coordination, balance, and social skills through various traditional Indonesian games. For example, Kusuma et al. (2023) found that games like Gobak Sodor improved locomotor and non-locomotor skills, especially when integrated into structured PE programs.

International research supports these observations. Jarani et al. (2016), in a study of Albanian school children, found that culturally embedded physical activities were more effective than Westernized sports drills in improving functional movement quality. Similarly, McKenzie and Lounsbery (2013) emphasized that culturally relevant games can increase student motivation, enjoyment, and active time during physical education classes, thereby improving motor outcomes. Notably, the effect sizes and correlation coefficients observed in this study are higher than those reported in studies utilizing traditional, drill-based PE instruction (Johnson & Lee, 2020; Logan et al., 2015). This difference may reflect the intrinsic motivation and engagement elicited by culturally familiar games like Hadang, which combine physical, emotional, and cognitive dimensions in meaningful ways. This supports the Self-Determination Theory (Deci & Ryan, 2000), which suggests that activities promoting autonomy, relatedness, and competence lead to more effective learning and sustained participation. Furthermore, this study contributes uniquely to the literature by isolating Hadang as a single-game intervention, rather than combining multiple traditional games into a composite program. This approach enables a clearer understanding of the specific motor benefits associated with Hadang and lays the groundwork for comparative studies across different traditional games.

The implications of these findings are theoretically significant, pedagogically relevant, and policy-oriented. From a theoretical standpoint, the research provides empirical support for the proposition that motor skill acquisition is optimized when learning environments are meaningful, social, and embedded in cultural context. The use of Hadang thus reflects a constructivist approach to motor learning, where students actively build motor competence through experiential, context-sensitive play. From a pedagogical perspective, the findings suggest that Hadang can be effectively used as a core component of physical education curricula in Indonesian primary schools. The game's simplicity, minimal equipment requirements, and compatibility with cooperative learning models make it suitable for low-resource educational settings, particularly in rural areas where access to formal sports facilities may be limited. Moreover, Hadang supports the Merdeka Belajar (freedom to learn) philosophy promoted by the Ministry of Education, which encourages contextualized, student-centered, and locally grounded learning experiences (Kemendikbud, 2020).

The positive association between Hadang and fine motor control also opens new possibilities for cross-curricular integration. For example, the game may be used in combination with handwriting or art-based tasks to reinforce manual dexterity in younger students.

Additionally, because the game promotes teamwork, strategic thinking, and communication, it offers affective and cognitive benefits that align with the goals of holistic education (Bailey et al., 2009). At the policy level, these findings advocate for the revitalization and formal adoption of traditional games in Indonesia's national curriculum. While sports like soccer and badminton are often prioritized in school PE programs, traditional games like Hadang represent a culturally rooted alternative that is no less effective in promoting physical health and developmental competencies.

Despite its contributions, the present study is not without limitations. First, the single-site data collection limits the generalizability of the findings across broader populations. The participants shared similar cultural backgrounds and familiarity with Hadang, which may have influenced both participation levels and performance outcomes. Second, the study's cross-sectional design restricts its ability to establish causality. While strong correlations were observed, longitudinal or experimental research is required to determine the directionality and durability of the observed relationships. The absence of a control group further limits comparisons with alternative interventions or standard PE activities. Third, the observation-based assessment of Hadang participation—though structured—may be subject to observer bias and inconsistencies in interpretation. Future research should employ more objective measurement tools, such as accelerometers, video-based motion analysis, or digital assessment platforms, to enhance the reliability of behavioral data. Fourth, while the study examined motor skills, it did not account for other potential mediating variables, such as nutrition, socioeconomic status, home environment, or comorbid health conditions. These factors could have influenced the children's motor development trajectories and should be considered in future research.

Building on the current findings, future research should pursue multi-site, longitudinal, and randomized controlled trials to verify the efficacy of Hadang as a structured motor intervention. Comparative studies between Hadang and other traditional or modern physical activities would help clarify its relative impact on different motor domains. Research should also explore the potential of Hadang as a therapeutic or inclusive intervention for children with special needs, particularly those with developmental coordination disorder (DCD), attention deficit hyperactivity disorder (ADHD), or autism spectrum disorder (ASD). The social, repetitive, and rule-based structure of Hadang may offer unique benefits for these populations. Furthermore, studies could examine how integrating Hadang into broader school health promotion programs affects outcomes such as academic performance, self-esteem, social cohesion, and school attendance. Given Indonesia's diversity, it would also be valuable to explore regional variations of Hadang and other traditional games to develop a national database of culturally responsive physical activities.

CONCLUSION

This research provides compelling evidence for a strong positive correlation between traditional folk game Hadang and motor skill development among elementary school students. The findings support the integration of culturally relevant traditional games in physical education curricula as effective tools for promoting motor competence. The study reinforces the importance of preserving and utilizing traditional games not merely as cultural artifacts but as evidence-based educational interventions. These results have significant implications for educational policy, suggesting that traditional games can contribute meaningfully to achieving motor development objectives in elementary education. Future research should explore longitudinal effects, investigate optimal implementation protocols, and examine the correlation across diverse Indonesian regions and traditional games. We recommend that educational institutions consider systematic integration of Hadang and similar traditional games in their physical education programs.

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CONFLICT OF INTEREST

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