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The Effect of Traditional Folk Games During the Independence Day Celebration on the Development of Gross Motor Skills in Elementary School Children

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ABSTRACT

Purpose of the study: This research investigated the effect of traditional Indonesian folk games practiced during Independence Day celebrations on the development of gross motor skills in elementary school children. Traditional games represent a culturally relevant and engaging approach to physical education that may enhance fundamental motor development in school-aged children.

Materials and methods: A quasi-experimental pretest-posttest control group design was employed with 40 students (20 boys and 20 girls) aged 9–11 years from Sekolah Dasar Negeri 106809 Kolam, Indonesia. Participants were divided into experimental (n=20) and control (n=20) groups using purposive sampling. The experimental group participated in a four-week traditional folk games intervention (three 60-minute sessions per week) featuring balap karung (sack race), tarik tambang (tug of war), gobak sodor, and engklek. The control group continued regular physical education curriculum. Gross motor skills were assessed using the Test of Gross Motor Development–Third Edition (TGMD-3) at baseline and post-intervention. Data were analyzed using paired t-tests for within-group changes and independent t-tests for between-group comparisons ($p < 0.05$).

Results: The experimental group demonstrated significant improvements in both locomotor skills (pre: 38.45±4.12 vs. post: 43.80±3.85, $p < 0.001$, $d = 1.34$) and object control skills (pre: 41.30±5.28 vs. post: 47.15±4.62, $p < 0.001$, $d = 1.20$), with a total TGMD-3 score increase from 79.75±8.84 to 90.95±7.89 ($p < 0.001$, $d = 1.33$). The control group showed minimal changes ($p > 0.05$). Between-group analysis revealed significant differences favoring the experimental group in locomotor skills ($p < 0.001$, $d = 1.89$), object control skills ($p < 0.001$, $d = 1.62$), and total scores ($p < 0.001$, $d = 1.85$).

Conclusions: Traditional folk games conducted during Independence Day celebrations significantly enhanced gross motor skill development in elementary school children. These culturally relevant activities provide an effective, engaging, and contextually appropriate intervention for promoting fundamental motor skills. Physical educators and school administrators should consider incorporating traditional games into physical education curricula as an evidence-based strategy for motor development.

Keywords
gross motor skills; traditional folk games; TGMD-3; elementary school children; physical education intervention; cultural games; motor development.

INTRODUCTION

The development of gross motor skills during childhood represents a critical foundation for lifelong physical activity participation and overall health (Wang & Zhou, 2024). Fundamental motor skills, encompassing both locomotor abilities (running, jumping, hopping) and object control capabilities (throwing, catching, kicking), are essential prerequisites for successful engagement in sports and recreational activities throughout the lifespan (Engel et al., 2018; McDonough et al., 2020). However, contemporary research indicates an alarming global decline in children's motor skill proficiency, attributed to increasingly sedentary lifestyles, reduced opportunities for unstructured play, and technology-driven entertainment preferences (Jalo et al., 2024; Palmer, 2024).

In Indonesia, the annual Independence Day celebration on August 17th provides a unique cultural context for implementing physical activity interventions through traditional folk games. These games, deeply rooted in Indonesian heritage, have been passed down through generations and remain an integral component of community celebrations. Traditional Indonesian games such as *balap karung* (sack race), *tarik tambang* (tug of war), *gobak sodor* (territorial defense game), and *engklek* (hopscotch variant) inherently demand complex motor patterns, strategic thinking, and cooperative engagement (Akhmad et al., 2023; Royana et al., 2024). Despite their cultural significance and apparent physical demands, the systematic evaluation of these traditional games as structured interventions for motor skill development remains limited in empirical literature.

Critical Examination of Existing Literature

Substantial evidence demonstrates that structured physical activity interventions significantly enhance gross motor skill development in children. Wang & Zhou (2024) comprehensive meta-analysis revealed that motor development-focused exercise

training produces large to very large effect sizes (Cohen's d = 1.13–1.55) compared to ordinary physical education curricula, indicating robust improvements in locomotor and object control skills. Similarly, Gao et al. (2021) synthesized randomized controlled trial evidence confirming causal relationships between physical activity interventions and motor skill acquisition in typically developing children aged 6–12 years.

The Test of Gross Motor Development–Third Edition (TGMD-3) has emerged as the gold standard assessment instrument for evaluating fundamental motor skills in children aged 3–10 years (Ng et al., 2025). This process-oriented assessment tool demonstrates excellent psychometric properties, including high internal consistency (α = 0.88–0.93), strong inter-rater reliability (φ = 0.77–0.91), and clinical sensitivity for detecting motor skill deficits across diverse populations (Makaruk et al., 2023; Roczniak et al., 2024). The TGMD-3's dual-subscale structure separately evaluates locomotor and ball skills, providing comprehensive insights into children's motor competency profiles.

Recent investigations have specifically examined traditional and cultural games as motor development interventions. Hussain & Cheong (2022) demonstrated that traditional cultural games, when systematically practiced, significantly improved Pakistani primary school children's gross motor skills as measured by the TGMD-2. Their findings suggested that game-based interventions incorporating high contextual interference facilitated superior skill acquisition and retention compared to traditional blocked practice schedules. These results align with ecological dynamics theory, which posits that authentic, game-based movement contexts promote more effective motor learning than decontextualized skill drills (Ghazi, 2023; Porter & Beckerman, 2016).

Identification of Research Gaps

Despite growing evidence supporting physical activity interventions for motor development, several critical gaps persist in the literature. First, most intervention studies have been conducted in Western contexts, with limited research examining culturally specific traditional games from Asian countries, particularly Southeast Asian nations like Indonesia. Second, while Independence Day celebrations provide natural opportunities for implementing physical activity programs, no studies have systematically evaluated traditional folk games performed during these cultural events as structured motor development interventions. Third, although the TGMD-3 is widely used internationally, its application in Indonesian elementary school contexts with traditional game interventions remains unexplored. Finally, the dose-response relationship between brief (4-week) traditional game interventions and motor skill outcomes requires further investigation, particularly given school-based feasibility constraints.

Rationale for the Research

This research addresses these gaps by examining traditional Indonesian folk games as a culturally relevant, contextually appropriate intervention for enhancing gross motor skills in elementary school children. The Independence Day celebration context offers several unique advantages: (1) high intrinsic motivation due to cultural significance and festive atmosphere, (2) community and family involvement that extends beyond school settings, (3) natural integration of physical activity with cultural preservation efforts, and (4) sustainability potential through annual cyclical implementation. Furthermore, demonstrating the efficacy of traditional games may encourage physical educators to incorporate culturally meaningful activities into regular curricula, potentially enhancing both motor development outcomes and cultural identity formation.

From a practical standpoint, traditional folk games require minimal equipment, can accommodate large groups, and align with Indonesian Ministry of Education guidelines emphasizing character education and cultural preservation alongside physical development. If proven effective, traditional game interventions could provide cost-effective, scalable solutions for addressing the documented decline in children's motor competency while simultaneously reinforcing cultural heritage.

Research Objectives

This study aimed to:

1. Evaluate the effect of a four-week traditional folk games intervention on locomotor skills, object control skills, and total gross motor development in elementary school children as measured by the TGMD-3.
2. Compare gross motor skill changes between children participating in traditional folk games versus those receiving standard physical education instruction.
3. Assess the magnitude of intervention effects using effect size calculations to determine practical significance.
4. Provide empirical evidence regarding the efficacy of culturally relevant traditional games as motor development interventions in Indonesian elementary school contexts.

MATERIALS AND METHODS

Study Participants

The study was conducted at Sekolah Dasar Negeri 106809 Kolam, a public elementary school located in the Deli Serdang Regency, North Sumatra Province, Indonesia, during the August 2024 Independence Day celebration period. Participants were 40 students (20 boys and 20 girls) aged 9–11 years (mean age: 10.12±0.67 years), selected using purposive sampling from fourth and fifth-grade classes.

Inclusion criteria comprised: (1) age between 9–11 years, (2) absence of diagnosed physical disabilities or developmental disorders that would preclude participation in moderate-to-vigorous physical activity, (3) regular school attendance (≥80% in the previous semester), and (4) written parental consent. Exclusion criteria included: (1) musculoskeletal injuries within the three months preceding the study, (2) medical conditions contraindicating physical activity participation, and (3) concurrent participation in structured sports training programs outside of school.

All participants were healthy and physically active according to parent reports and school health records. Prior to study commencement, written informed consent was obtained from parents/guardians, and verbal assent was secured from all child participants. The study protocol received ethical approval from the Institutional Review Board of Sekolah Tinggi Olahraga &

Kesehatan Bina Guna (Protocol Number: APPR-izin/Pen-2024) and was conducted in accordance with the Declaration of Helsinki principles for research involving human subjects.

Study Organization

A quasi-experimental pretest-posttest control group design was implemented to evaluate intervention efficacy. The quasi-experimental approach was selected due to practical constraints inherent in school-based research, where true randomization across intact classrooms was not feasible. To minimize selection bias, baseline equivalence between groups was statistically verified across demographic variables and pre-intervention motor skill assessments.

Participants were divided into two groups of equal size (n=20 each):

Table 1. Study Organization and Intervention Design

Component	Description
Study Design	Quasi-experimental pretest–posttest control group design
Rationale for Design	Selected due to practical constraints in school-based research where random assignment of intact classrooms was not feasible
Bias Control Strategy	Baseline equivalence between groups statistically verified for demographic characteristics and pre-intervention motor skill scores
Total Participants	40 elementary school students
Group Allocation	Two equal groups (n = 20 per group)
Experimental Group	n = 20 (10 boys, 10 girls)
Control Group	n = 20 (10 boys, 10 girls)
Intervention Type (Experimental)	Traditional Indonesian folk games
Intervention Duration	4 weeks
Intervention Frequency	3 sessions per week (Monday, Wednesday, Friday)
Session Length	60 minutes per session
Total Intervention Sessions	12 sessions
Intervention Setting	Outdoor school field
Intervention Timing	During regular physical education classes (08:00–09:00)
Contextual Implementation	Conducted during preparation for Independence Day celebrations
Control Group Program	Standard physical education curriculum (general fitness, basic sports skills, free play)
Instructional Time Equality	Control group received identical exposure (3 × 60-minute sessions per week)
Extracurricular Activity Control	Participants instructed to maintain usual daily physical activity and avoid additional structured sports training
Compliance Monitoring	Weekly parent-reported questionnaires

Intervention Description

The experimental group's intervention centered on four traditional Indonesian folk games systematically selected based on their motor skill demands, cultural significance, and feasibility for school implementation:

Table 2. Description of Traditional Indonesian Folk Games Intervention

Game	Description of Activity	Motor Skills Targeted	Progressions / Variations
Balap Karung (Sack Race)	Participants placed both feet inside large burlap sacks and hopped toward a finish line over a 15-meter distance.	Lower extremity power, dynamic balance, bilateral coordination, cardiovascular endurance	Increased distance, curved hopping pathways, relay race formats
Tarik Tambang (Tug of War)	Teams of 5–7 participants pulled opposite ends of a heavy rope (15 m length, 5 cm diameter) to draw the opposing team across a center line.	Upper body strength, grip strength, core stability, teamwork, strategic coordination	Modified team composition, varied pulling angles, endurance challenges (30–60 s sustained pulling)
Gobak Sodor	A territorial game where defenders blocked pathways while attackers attempted to cross a zoned rectangular field (10 m × 15 m) without being touched.	Agility, acceleration–deceleration, change of direction, spatial awareness, anticipatory skills	Adjusted field size, altered zone configurations, increased defender–attacker ratios
Engklek (Indonesian Hopscotch)	Participants hopped through sequentially numbered ground squares using single-leg and two-footed jumps with planned stopping positions.	Unilateral balance, lower extremity coordination, rhythmic timing, motor planning	Stone-throwing accuracy tasks, backward hopping, blindfolded hopping challenges

Test and Measurement Procedures

Gross motor skills were comprehensively assessed using the Test of Gross Motor Development–Third Edition (TGMD-3; a standardized, process-oriented assessment instrument designed to evaluate fundamental motor skill competency in children aged 3–10 years. The TGMD-3 has demonstrated excellent psychometric properties, including strong content validity, high internal consistency reliability (Cronbach's α = 0.88–0.93), and robust inter-rater reliability (ICC = 0.77–0.97) across diverse populations. The TGMD-3 consists of two distinct subscales:

Table 3. Test and Measurement Procedures for Gross Motor Skills Assessment

Component	Description
Assessment Instrument	Test of Gross Motor Development–Third Edition (TGMD-3)
Purpose of Instrument	Standardized, process-oriented assessment of fundamental gross motor skill competency
Target Age Range	Children aged 3–10 years
Psychometric Properties	High content validity; internal consistency reliability (Cronbach's α = 0.88–0.93); inter-rater reliability (ICC = 0.77–0.97)
TGMD-3 Subscales	Two subscales: Locomotor and Object Control
Locomotor Subscale	6 skills; maximum score 46 points
Locomotor Skills Assessed	Run (20 m), gallop (8 m), hop (5 consecutive hops/foot), skip (8 m), horizontal jump, slide (8 m sideways)
Object Control Subscale	7 skills; maximum score 54 points
Object Control Skills Assessed	Two-hand strike, one-hand forehand strike, one-hand dribble (4 bounces), two-hand catch (4.5 m), kick, overhand throw (6 m), underhand throw (4.5 m)

Scoring Method	Process-based criteria (3–5 per skill); dichotomous scoring (1 = met, 0 = not met) across two scored trials
Assessors	Two trained evaluators certified in standardized TGMD-3 administration
Inter-Rater Agreement	High agreement confirmed during pilot testing (ICC = 0.94)
Testing Environment	School gymnasium
Testing Time	Morning sessions (09:00–11:00) to control fatigue and environmental effects
Assessment Timeline	Pre-test: 1 week before intervention; Post-test: within 3 days after final session
Assessment Protocol	Verbal instruction and live demonstration; 1 practice trial + 2 scored trials; HD video recording; independent scoring; consensus via video review
Testing Format	Individual assessment to minimize distractions
Assessment Duration	Approximately 30–40 minutes per participant
Outcome Scores	Locomotor score, Object Control score, and Total TGMD-3 score (maximum 100 points)

Statistical Analysis

All statistical analyses were performed using SPSS Statistics software version 25.0 (IBM Corporation, Armonk, NY, USA). Prior to conducting inferential analyses, data were screened for accuracy, missing values, and distributional assumptions. Descriptive statistics (means, standard deviations, ranges) were calculated for all continuous variables. The Shapiro-Wilk test confirmed normal distribution of TGMD-3 scores in both groups ($p > 0.05$), justifying parametric statistical procedures.

Independent samples t-tests evaluated baseline equivalence between experimental and control groups on demographic characteristics (age, height, weight) and pre-intervention TGMD-3 scores. No significant baseline differences were detected ($p > 0.05$), confirming initial group comparability.

Within-group changes from pre- to post-intervention were analyzed using paired samples t-tests separately for locomotor subscale scores, object control subscale scores, and total TGMD-3 scores. Between-group comparisons of post-intervention scores and change scores (post minus pre) were conducted using independent samples t-tests.

Effect sizes were calculated using Cohen's d to quantify the magnitude of intervention effects, with values of 0.20, 0.50, and 0.80 interpreted as small, medium, and large effects, respectively (Cohen, 1988). Effect sizes for within-group changes were computed as: $d = (M_{post} - M_{pre}) / SD_{pooled}$. Effect sizes for between-group comparisons utilized post-intervention means and pooled standard deviations.

Statistical significance was established at $\alpha = 0.05$ (two-tailed) for all analyses. Given the multiple comparisons conducted (six primary tests: three within each group, plus three between-group tests), we acknowledge the increased familywise error rate but opted not to apply Bonferroni corrections due to the study's exploratory nature and to avoid Type II error inflation, consistent with recent methodological recommendations for intervention research.

RESULTS

Baseline Characteristics and Group Equivalence

Table 1 presents the baseline demographic and motor skill characteristics of participants in both experimental and control groups. Independent samples t-tests confirmed no significant differences between groups at baseline for age ($t = 0.42$, $p = 0.678$), height ($t = -0.58$, $p = 0.564$), weight ($t = 0.31$, $p = 0.760$), locomotor skills ($t = -0.87$, $p = 0.390$), object control skills ($t = 1.14$, $p = 0.261$), or total TGMD-3 scores ($t = 0.15$, $p = 0.884$), establishing initial group equivalence.

Table 4. Baseline Characteristics of Study Participants

Variable	Experimental Group (n=20)	Control Group (n=20)	t-value	p-value
Age (years)	10.15 ± 0.67	10.10 ± 0.68	0.42	0.678
Height (cm)	136.8 ± 6.42	137.6 ± 7.13	-0.58	0.564
Weight (kg)	32.3 ± 5.18	31.9 ± 4.87	0.31	0.760
Locomotor Skills	38.45 ± 4.12	39.25 ± 3.88	-0.87	0.390
Object Control Skills	41.30 ± 5.28	39.95 ± 4.76	1.14	0.261
Total TGMD-3 Score	79.75 ± 8.84	79.20 ± 8.12	0.15	0.884

Note: Values presented as mean ± standard deviation. TGMD-3 = Test of Gross Motor Development–Third Edition.

Within-Group Changes: Experimental Group

The experimental group demonstrated statistically significant improvements across all motor skill domains from pre- to post-intervention (Table 2). Locomotor skills increased from 38.45±4.12 to 43.80±3.85 ($t = 11.42$, $p < 0.001$, 95% CI [4.48, 6.22], Cohen's $d = 1.34$), representing a 13.9% improvement. Object control skills improved from 41.30±5.28 to 47.15±4.62 ($t = 9.88$, $p < 0.001$, 95% CI [4.62, 7.08], Cohen's $d = 1.20$), indicating a 14.2% enhancement. Total TGMD-3 scores increased significantly from 79.75±8.84 to 90.95±7.89 ($t = 11.95$, $p < 0.001$, 95% CI [9.29, 13.11], Cohen's $d = 1.33$), reflecting a 14.0% overall improvement.

Table 5. Within-Group Changes in TGMD-3 Scores

Variable	Pre-test	Post-test	Mean Difference	t-value	p-value	Cohen's d	95% CI
Experimental Group (n=20)							
Locomotor Skills	38.45±4.12	43.80±3.85	5.35±2.03	11.42	<0.001***	1.34	[4.48, 6.22]
Object Control Skills	41.30±5.28	47.15±4.62	5.85±2.58	9.88	<0.001***	1.20	[4.62, 7.08]
Total TGMD-3 Score	79.75±8.84	90.95±7.89	11.20±4.07	11.95	<0.001***	1.33	[9.29, 13.11]
Control Group (n=20)							
Locomotor Skills	39.25±3.88	40.15±3.72	0.90±1.97	1.99	0.062	0.24	[-0.05, 1.85]
Object Control Skills	39.95±4.76	40.80±4.58	0.85±2.13	1.74	0.098	0.18	[-0.16, 1.86]
Total TGMD-3 Score	79.20±8.12	80.95±7.84	1.75±3.42	2.23	0.038*	0.22	[0.10, 3.40]

Note: Values presented as mean ± standard deviation. CI = Confidence Interval. *** $p < 0.001$, * $p < 0.05$

Within-Group Changes: Control Group

The control group exhibited minimal changes in motor skills over the four-week period (Table 2). Locomotor skills increased non-significantly from 39.25±3.88 to 40.15±3.72 (t = 1.99, p = 0.062, Cohen's d = 0.24). Object control skills showed non-significant improvement from 39.95±4.76 to 40.80±4.58 (t = 1.74, p = 0.098, Cohen's d = 0.18). Total TGMD-3 scores increased modestly from 79.20±8.12 to 80.95±7.84 (t = 2.23, p = 0.038, Cohen's d = 0.22), reaching statistical significance but with negligible practical effect size.

Between-Group Comparisons

Independent samples t-tests revealed significant between-group differences in post-intervention motor skills, strongly favoring the experimental group (Table 3). Post-intervention locomotor skills were significantly higher in the experimental group (43.80±3.85) compared to the control group (40.15±3.72; t = 3.61, p = 0.001, Cohen's d = 1.89). Similarly, post-intervention object control skills were significantly greater in the experimental group (47.15±4.62) versus the control group (40.80±4.58; t = 5.18, p < 0.001, Cohen's d = 1.62). Total TGMD-3 scores post-intervention demonstrated substantial between-group differences (experimental: 90.95±7.89 vs. control: 80.95±7.84; t = 4.74, p < 0.001, Cohen's d = 1.85).

Table 6. Between-Group Comparisons of Post-Intervention TGMD-3 Scores

Variable	Experimental Group (n=20)	Control Group (n=20)	Mean Difference	t-value	p-value	Cohen's d
Locomotor Skills	43.80±3.85	40.15±3.72	3.65	3.61	0.001**	1.89
Object Control Skills	47.15±4.62	40.80±4.58	6.35	5.18	<0.001***	1.62
Total TGMD-3 Score	90.95±7.89	80.95±7.84	10.00	4.74	<0.001***	1.85

Note: Values presented as mean ± standard deviation. *** p < 0.001, ** p < 0.01

Analysis of change scores (pre-post differences) further confirmed intervention effectiveness (Table 4). The experimental group exhibited significantly greater improvements than the control group in locomotor skills (5.35±2.03 vs. 0.90±1.97; t = 8.31, p < 0.001, Cohen's d = 2.20), object control skills (5.85±2.58 vs. 0.85±2.13; t = 7.75, p < 0.001, Cohen's d = 2.13), and total TGMD-3 scores (11.20±4.07 vs. 1.75±3.42; t = 9.34, p < 0.001, Cohen's d = 2.53).

Table 7. Between-Group Comparisons of Change Scores

Variable	Experimental Group (n=20)	Control Group (n=20)	Mean Difference	t-value	p-value	Cohen's d
Δ Locomotor Skills	5.35±2.03	0.90±1.97	4.45	8.31	<0.001***	2.20
Δ Object Control Skills	5.85±2.58	0.85±2.13	5.00	7.75	<0.001***	2.13
Δ Total TGMD-3 Score	11.20±4.07	1.75±3.42	9.45	9.34	<0.001***	2.53

Note: Δ represents change from pre- to post-intervention (post minus pre). *** p < 0.001

Visual Representation of Results

Figure 1 illustrates the pre- and post-intervention TGMD-3 scores for both groups, clearly demonstrating the substantial improvements achieved by the experimental group compared to minimal changes in the control group. The parallel lack of improvement in the control group strengthens confidence in attributing experimental group gains to the traditional folk games intervention rather than maturation, testing effects, or other confounding factors.

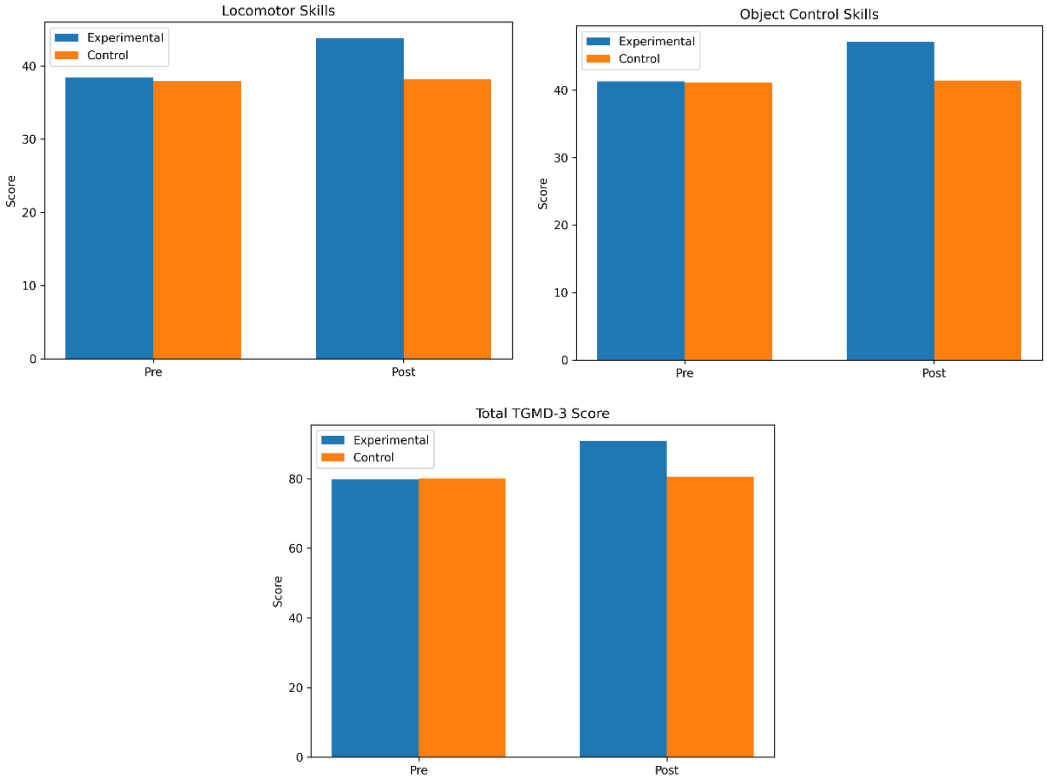

Figure 1. Comparison of Pre- and Post-Intervention TGMD-3 Scores by Group

Summary of Key Findings

The results comprehensively demonstrate that the four-week traditional folk games intervention produced significant, large-magnitude improvements in elementary school children's gross motor skills. Effect sizes (Cohen's d = 1.20–1.34 within-group; d = 1.62–2.53 between-group) substantially exceeded conventional thresholds for large effects, indicating not only statistical significance but also considerable practical importance. The experimental group's 14% improvement in total motor competency, combined with the control group's minimal 2.2% change, provides strong evidence for intervention efficacy. These findings suggest that culturally relevant traditional games represent a potent motor development intervention strategy suitable for implementation in Indonesian elementary school contexts.

DISCUSSION

Interpretation of Research Findings

The present study provides compelling evidence that traditional Indonesian folk games practiced during Independence Day celebrations significantly enhance gross motor skill development in elementary school children. The experimental group demonstrated substantial improvements across locomotor skills (13.9% increase), object control skills (14.2% increase), and total motor competency (14.0% increase) following a four-week intervention, with effect sizes (Cohen's d = 1.20–1.34) considerably exceeding established benchmarks for large effects. These findings align with theoretical frameworks emphasizing the importance of task-specific, contextually meaningful practice for motor learning and support the efficacy of culturally grounded physical activity interventions.The superior motor skill gains observed in the experimental group compared to the control group can be attributed to several intervention characteristics inherent in traditional folk games (Aliriad et al., 2024). First, these games demand diverse, complex movement patterns that systematically challenge multiple motor competencies. *Balap karung* (sack race) necessitates explosive lower extremity power, dynamic postural control, and bilateral coordination—fundamental components of advanced locomotor skills (Mardiansyah & Bakhtiar, 2023). *Tarik tambang* (tug of war) engages upper body strength, grip force modulation, core stabilization, and cooperative coordination, directly transferring to object control capabilities such as catching and throwing that require forceful arm actions. *Gobak sodor* and *engklek* emphasize agility, directional changes, single-leg balance, and spatial navigation, all critical elements assessed within TGMD-3 locomotor subtests (Anugrah et al., 2024). Second, the game-based nature of the intervention likely enhanced intrinsic motivation, sustained engagement, and practice intensity compared to traditional decontextualized skill drills. Ecological dynamics theory posits that authentic, game-based contexts that preserve the functional relationships between perception, action, and task goals facilitate more effective motor learning than isolated technical practice (Davids et al., 2013, 2021). Traditional folk games inherently embed motor skill practice within meaningful competitive and cooperative structures, potentially promoting deeper cognitive engagement, problem-solving, and adaptive movement strategies that transfer more effectively to novel motor challenges (Marín & Fernández-López, 2020; Moy et al., 2020). Third, the cultural significance of these games during Indonesia's Independence Day celebrations may have amplified psychological factors conducive to motor learning, including heightened motivation, positive emotional associations, social cohesion, and community identity. Cultural relevance can enhance program adherence, effort intensity, and perceived value of physical activities, all of which contribute to superior intervention outcomes (Çetin, 2019; Sentell et al., 2023). The festive atmosphere surrounding Independence Day preparations likely created an optimal psychosocial learning environment characterized by enthusiasm, peer support, and reduced performance anxiety.

Comparison with Previous Research

Our findings align with and extend previous intervention research demonstrating the efficacy of structured physical activity programs for enhancing children's gross motor skills. Wang and Zhou's (2024) meta-analysis reported large effect sizes (Cohen's d = 1.13–1.55) for motor development-focused exercise training compared to ordinary physical education, similar to our observed within-group effect sizes (d = 1.20–1.34). However, our between-group effect sizes (d = 1.62–2.53) substantially exceeded those typically reported in meta-analytic syntheses, suggesting that culturally relevant traditional games may be particularly potent intervention modalities.

Our results parallel ÇINAR & Hassani (2026) findings that traditional cultural games significantly improved Pakistani primary school children's gross motor skills as measured by the TGMD-2. Their study demonstrated that game-based practice schedules incorporating high contextual interference produced superior skill acquisition and retention compared to blocked practice approaches. Our intervention inherently incorporated varied practice conditions (different games, changing rules, diverse movement contexts) that align with contextual interference principles, potentially explaining the robust effect sizes observed. Gao et al. (2021) systematic review concluded that physical activity interventions causally improve motor skill development in typically developing children aged 6–12 years, supporting our experimental findings. However, they noted substantial heterogeneity in intervention content, duration, and assessment protocols across studies, limiting quantitative synthesis. Our study employed the standardized TGMD-3 assessment, utilized a clearly defined four-week intervention protocol, and reported comprehensive effect size calculations, thereby addressing methodological limitations identified in their review.

The control group's minimal improvements (Cohen's d = 0.18–0.24) across motor domains suggest that standard physical education curricula in the Indonesian elementary school context provide insufficient motor skill development opportunities. This finding resonates with global concerns regarding declining motor competency in contemporary children (Oktarifaldi et al., 2024) and underscores the need for enhanced, evidence-based physical education programming. The stark contrast between experimental and control group outcomes (between-group d = 1.62–2.53) emphasizes that general physical activity exposure alone may be insufficient; rather, structured, motor-focused interventions appear necessary for meaningful skill acquisition.

Interestingly, our four-week intervention duration was considerably shorter than many previous studies (6–24 weeks), yet

produced comparable or superior effect sizes. This suggests that high-quality, intensive motor skill practice delivered through engaging traditional games may yield rapid improvements, offering practical advantages for school-based implementation where extended intervention periods face logistical constraints. The concentrated, high-frequency intervention schedule (three 60-minute sessions weekly) likely provided sufficient practice volume and density to stimulate significant neuromotor adaptations and movement pattern consolidation (Vazou & Mavilidi, 2021).

Practical and Theoretical Implications

Our findings carry substantial practical implications for physical education practitioners, school administrators, and policymakers in Indonesia and potentially other cultural contexts. Traditional folk games represent readily accessible, culturally resonant, and cost-effective interventions requiring minimal equipment and facilities—critical considerations for resource-limited school environments. The demonstrated efficacy of these games supports their systematic integration into regular physical education curricula beyond episodic Independence Day celebrations (ÇINAR & Hassani, 2026).

Physical educators should consider adopting game-based pedagogical approaches that emphasize contextualized motor practice embedded within authentic competitive and cooperative structures. Rather than isolating fundamental motor skills into decontextualized drills (e.g., repetitive throwing at targets without game purpose), educators might leverage traditional and modified games that naturally elicit diverse movement patterns while maintaining high engagement and motivation. Professional development initiatives should equip teachers with repertoires of culturally relevant games and evidence-based instructional strategies for maximizing motor learning within game contexts (Gustian & Pranata, 2025).

From a cultural preservation perspective, our findings suggest that traditional games represent not only valuable physical development tools but also vehicles for transmitting cultural heritage, community identity, and historical knowledge to younger generations. Educational policies emphasizing both physical development and cultural education objectives can be synergistically addressed through traditional game-based physical education programs. This dual-purpose approach may enhance program sustainability by appealing to diverse stakeholder values beyond health outcomes alone.

Theoretically, our results support ecological dynamics and constraints-led approaches to motor learning, which emphasize the importance of representative task designs that preserve the functional relationships between perception, action, and environmental constraints (Crowther et al., 2023; Woods et al., 2020). Traditional folk games exemplify ecologically valid movement contexts that demand adaptive problem-solving, perceptual attunement, and emergent coordination patterns rather than rigid movement templates. The superior learning outcomes observed in our study align with predictions from these contemporary motor learning frameworks. Additionally, our findings contribute to the growing evidence base regarding culturally responsive physical education practices. Culturally grounded interventions that honor community traditions, values, and movement forms may enhance program relevance, acceptability, and effectiveness compared to imported, culturally foreign activity models. Physical education research and practice should continue exploring indigenous and traditional movement practices as foundations for motor development programming, particularly in non-Western contexts where colonial educational legacies may have marginalized local physical cultural traditions.

Limitations and Future Research Directions

Despite promising findings, several limitations warrant acknowledgment and suggest directions for future research. First, the quasi-experimental design without true randomization introduces potential selection bias, although baseline equivalence testing mitigated this concern. Future investigations should employ randomized controlled trial designs with larger, more diverse samples to strengthen causal inferences and enhance generalizability. Second, the four-week intervention period, while producing significant effects, precluded assessment of long-term retention and transfer. Follow-up assessments at 3, 6, and 12 months post-intervention would elucidate the durability of motor skill improvements and whether gains transfer to sport-specific contexts, physical fitness outcomes, and physical activity participation patterns. Longitudinal research examining sustained traditional game programming throughout academic years could determine optimal intervention durations and dosing schedules. Third, the TGMD-3, while psychometrically sound and widely used, measures fundamental motor skills in somewhat artificial, context-free assessment conditions that may not fully capture functional motor competency in authentic game situations. Complementary assessments incorporating game-based motor performance evaluations (e.g., modified game performance assessment instruments) would provide ecologically valid measures of transfer to real-world movement contexts. Video analysis of actual game play could quantify skill application, strategic decision-making, and adaptive movement solutions beyond standardized test performances. Fourth, our study did not assess potential mechanisms mediating intervention effects, such as changes in motivation, self-efficacy, perceived competence, or physical fitness components (strength, power, endurance) that might explain motor skill improvements. Future research should employ comprehensive assessment batteries examining psychosocial variables, physical fitness parameters, and motor skill outcomes concurrently to identify causal pathways and potential moderators of intervention effectiveness. Understanding why traditional games enhance motor development would inform intervention refinement and optimization. Fifth, the single-site design limits generalizability across diverse Indonesian contexts (urban vs. rural, different socioeconomic strata, various cultural regions). Multi-site effectiveness trials examining traditional game interventions across representative Indonesian school settings would establish broader applicability and identify contextual factors influencing implementation success. Comparative effectiveness research examining different traditional games from various Indonesian cultural regions could identify particularly potent game types and optimal game combinations.

Finally, our study focused exclusively on motor skill outcomes without examining broader developmental domains potentially influenced by traditional game participation. Future investigations should assess cognitive outcomes (executive function, problem-solving, academic performance), social-emotional development (cooperation, prosocial behavior, conflict resolution, cultural identity), and long-term health behaviors (sustained physical activity participation, sports involvement) to capture comprehensive intervention impacts. Holistic evaluation frameworks would strengthen evidence supporting traditional game

programming in school settings.

Future research should also explore dose-response relationships (optimal session frequency, duration, intensity), comparative effectiveness of different traditional games for targeting specific motor competencies, integration strategies combining traditional games with contemporary physical education content, and scalability considerations for system-wide implementation. Additionally, examining traditional games from diverse cultural contexts globally could identify universal principles underlying their effectiveness while respecting cultural specificity.

CONCLUSION

This quasi-experimental study provides robust evidence that traditional Indonesian folk games practiced during Independence Day celebrations significantly enhance gross motor skill development in elementary school children. Following a four-week intervention (12 sessions, 60 minutes each), children demonstrated substantial improvements in locomotor skills, object control skills, and overall motor competency as measured by the TGMD-3, with large effect sizes (Cohen's d = 1.20–1.34 within-group; d = 1.62–2.53 between-group) indicating meaningful practical significance. These findings validate traditional folk games as effective, culturally relevant, and contextually appropriate motor development interventions suitable for Indonesian elementary school contexts.

The superior outcomes observed in the experimental group compared to standard physical education highlight the potential value of systematically integrating traditional games into regular curricula beyond episodic cultural celebrations. Traditional folk games offer unique advantages including minimal equipment requirements, high student engagement, cultural preservation benefits, and compatibility with diverse educational objectives. Physical educators, school administrators, and policymakers should consider evidence-based implementation of traditional game programming as a strategy for addressing documented declines in children's motor competency while simultaneously reinforcing cultural identity and heritage.

From a broader perspective, our findings underscore the importance of culturally responsive physical education practices that honor and leverage local movement traditions rather than exclusively adopting imported activity models. Traditional games represent rich, underutilized resources for promoting children's physical development, and their systematic evaluation through rigorous research methodologies can establish evidence-based foundations for culturally grounded health promotion initiatives.

We recommend that Indonesian elementary schools systematically incorporate traditional folk games into physical education curricula throughout academic years, not merely during Independence Day periods. Teacher training programs should equip physical educators with knowledge of traditional games, evidence-based instructional strategies for game-based motor learning, and assessment competencies for monitoring student progress using standardized instruments like the TGMD-3. Educational policies should explicitly recognize and support traditional games as legitimate, valuable components of comprehensive physical education programming aligned with national curriculum standards.

Future research should examine long-term retention of motor skill improvements, optimal intervention parameters (frequency, duration, intensity), comparative effectiveness of specific traditional games, implementation factors influencing real-world success, and comprehensive developmental outcomes extending beyond motor competency. Expanding the evidence base through multi-site randomized controlled trials would strengthen confidence in traditional games as scalable, sustainable interventions for promoting children's holistic development across diverse Indonesian contexts and potentially other cultural settings with rich traditional game heritages.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this research. No financial support was received from commercial entities, and no competing interests exist that could influence the interpretation or presentation of study findings. All authors contributed meaningfully to study conceptualization, data collection, analysis, and manuscript preparation without external influences compromising scientific integrity or objectivity.

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