

The Effect of Traditional Games on Gross Motor Development in Early Childhood: A Quasi-Experimental Study

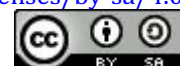
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Article Info :	ABSTRACT
Accepted: 29-06-2026 Approved: 12-08-2026 Published: 17-09-2026	Traditional games provide culturally meaningful movement experiences that may stimulate fundamental motor development during early childhood. However, controlled evidence remains limited for structured multi-game traditional interventions in Islamic early childhood education settings using criterion-based gross motor assessment. This study examined the effect of a structured traditional-games program on gross motor development among children attending RA Raudlotul Hidayah Sindang Laut. A quantitative quasi-experimental pretest-posttest control-group design was modeled with 79 children aged 5-6 years, comprising 40 children in the intervention group and 39 in the control group. The intervention consisted of an eight-week program delivered three times per week for approximately 35 minutes per session and incorporated engklek, gobak sodor, bakiak, boy-boyan, and jump-rope activities. Gross motor competence was assessed using performance criteria adapted from the Test of Gross Motor Development-Third Edition (TGMD-3), covering locomotor and ball-skill components. The current numerical results are illustrative rather than verified field findings; therefore, they cannot be interpreted as empirical evidence until replaced with actual participant data and the analyses are rerun. Conceptually, the study design is intended to test whether structured traditional games produce greater gross motor improvement than usual movement-learning activities after controlling for baseline performance. The educational implication is that, if supported by verified field data, structured traditional games may offer low-cost, culturally grounded activities for strengthening gross motor competence in early childhood settings.
Keywords: traditional games; gross motor development; early childhood; fundamental movement skills; quasi- experiment; TGMD-3	

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INTRODUCTION

Gross motor competence is a central component of early childhood development because it enables children to control large-muscle movements required for running, jumping, balancing, throwing, catching, and participation

in increasingly complex physical activities. Evidence from preschool settings indicates that fundamental movement skills are not acquired merely through biological maturation; they require repeated practice, appropriate instruction, and environments that provide meaningful movement opportunities. Structured motor interventions therefore have a legitimate place within early childhood curricula, particularly when daily routines are increasingly shaped by sedentary behavior and screen-based activities ([Ruiz-Esteban et al., 2020](#)).

The preschool period is especially important because movement patterns established at this stage can influence later physical activity trajectories. A systematic review of fundamental movement skills and accelerometer-measured physical activity highlighted early childhood as a key period for identifying movement-skill deficits and providing timely intervention ([A. Dobell et al., 2020](#)). Consistent with this perspective, a 10-week physical activity program in early childhood education centers produced improvements in locomotor and object-control skills among three- and four-year-old children, indicating that structured practice can generate measurable gains even over a relatively short period ([Ali et al., 2021](#)).

Play is a developmentally appropriate vehicle for such practice. Goal-oriented play can simultaneously create enjoyment and repeated opportunities to run, balance, throw, catch, and coordinate body movements. Experimental evidence has shown that carefully organized play activities can significantly improve several motor outcomes in children aged approximately 4.5-6 years ([Sutapa et al., 2021](#)). Outdoor play has likewise been associated with improvements in fundamental movement skills, suggesting that motor learning benefits from dynamic environments that allow children to explore different movement patterns and respond to changing spatial demands ([Supriady et al., 2023](#)).

Traditional games are particularly relevant in this context because they integrate movement learning with cultural experience. Unlike exercise drills that may be repetitive or decontextualized, traditional games usually combine rules, social interaction, competition or cooperation, rhythm, and varied motor demands. Indonesian research has reported improvements in gross motor performance through games such as bakiak, which require balance, coordinated stepping, postural control, and group synchronization ([Rahmat et al., 2024](#)). Similar work has shown that traditional games can increase gross motor abilities in early childhood when activities are systematically integrated into learning sessions ([Bendriyanti & Haryono, 2021](#)).

The pedagogical value of traditional games is also supported by evidence that they can stimulate locomotor, non-locomotor, and manipulative movements while remaining accessible to schools with limited equipment. A

traditional-game-based basic movement model developed for young children produced improvements in movement performance after implementation, illustrating the potential for local games to be transformed into purposeful learning experiences rather than being treated only as recreational heritage (Pratama et al., 2020). In addition, learning resources based on local traditional games have been developed to support teachers in connecting cultural content with gross motor stimulation in kindergarten settings (Shofiyah et al., 2022).

A broader Indonesian systematic review concluded that game-based learning models can stimulate motor development in early childhood and elementary-school populations, although the available studies vary considerably in design, sample size, intervention length, and outcome measurement (Suryadi et al., 2023). This heterogeneity is important because positive findings alone do not establish that every traditional-game intervention is equally effective. Studies based only on classroom action research or one-group pretest-posttest designs remain vulnerable to maturation, repeated-testing effects, teacher influence, and other rival explanations.

Several individual traditional games illustrate different motor mechanisms. The bakiak game has been quantitatively examined as an intervention for early childhood gross motor skills, emphasizing balance and coordinated movement (Yuningsih et al., 2023). Fortification-type games have also been discussed as activities that stimulate gross motor domains through running, changing direction, and coordinated group movement (Aldini et al., 2023). Hadangan, another traditional game involving locomotion and rapid directional change, has demonstrated positive effects on gross motor skills in an experimental educational context (Bernhardin et al., 2023).

Traditional games may additionally address an emerging educational problem: children can have fewer opportunities for vigorous, socially interactive movement when digital media dominate leisure activities. Teacher-oriented programs have therefore emphasized traditional games not only as cultural preservation tools but also as practical strategies for stimulating motor competence in kindergarten children (Jarwo et al., 2021). Reviews focusing specifically on children's gross motor development similarly identify traditional games as a potentially useful response to reduced physically active play (Afifah M & Purwoko, 2023).

Nevertheless, the literature shows two unresolved methodological issues. First, many local studies rely on small samples and do not include a comparison group, which restricts causal interpretation. Second, outcome measures are often broad teacher observations rather than standardized or

criterion-based motor assessments. Research describing preschool fundamental movement skills has emphasized the value of instruments such as the Test of Gross Motor Development for distinguishing locomotor and manipulative competencies in a structured manner (Ludyana et al., 2022). A study comparing traditional games with free play likewise suggests that the structure of play matters: children may gain more when movement experiences are deliberately organized rather than left entirely to unstructured exposure (Tan et al., 2020).

International evidence strengthens the rationale for a controlled intervention. A randomized outdoor loose-parts trial demonstrated that changes to the play environment can influence motor-skill opportunities and highlighted early childhood settings as feasible sites for motor interventions (Branje et al., 2021). More recent work integrating fundamental movement skills with mathematics also shows that movement can be embedded into routine educational activities without positioning physical development as separate from classroom learning. Furthermore, a meta-analysis of physical activity programs in children aged 3-7 years reported overall positive effects on fundamental movement skills, reinforcing the value of intentional, structured programs during this developmental window (Yang et al., 2025).

Game-based approaches continue to evolve. A 2026 experimental study of somatosensory game-based activity reported stronger locomotor development for preschool children than conventional physical activity lessons in selected skills, suggesting that engagement, embodied learning, and progressive task design are increasingly important characteristics of effective motor programs (Wei & Dong, 2026). In a different game context, a 12-week flag-rugby program improved several gross motor and physical-fitness outcomes in five- to six-year-old children, illustrating how diversified movement tasks can promote both locomotor and object-control performance (Shi et al., 2024).

Despite these advances, evidence remains limited for structured multi-game traditional interventions in Islamic early childhood education settings using a control group and criterion-based gross motor assessment. This gap is important because the existing literature supports structured movement practice, yet differences in design, measurement, and intervention format make it difficult to determine whether a deliberately sequenced combination of traditional games produces additional benefits over usual school movement activities. The present study was therefore designed to examine the effect of an eight-week traditional-games program on gross motor development among children at RA Raudlotul Hidayah Sindang Laut.

The primary hypothesis was that children receiving the traditional-games intervention would demonstrate significantly greater post-intervention gross motor competence than children receiving the usual movement-learning activities after controlling for baseline performance. The expected benefit of the study is to provide teachers with a structured basis for selecting culturally familiar games according to specific movement objectives.

Its practical implication is to support the integration of traditional games into early childhood learning as planned motor-learning activities, while its research implication is to strengthen controlled, criterion-based evaluation of gross motor interventions in an RA educational setting. No preliminary field observation quantifying a local gross-motor deficit was available in the manuscript; therefore, such a claim has not been invented and should be added only if supported by documented field evidence.

RESEARCH METHOD

Research Design and Participants

This manuscript models a quantitative quasi-experimental study using a pretest-posttest control-group design. The illustrative sample consisted of 79 children aged 5-6 years enrolled at RA Raudlotul Hidayah Sindang Laut. Intact classes were assigned to the intervention ($n = 40$) or control group ($n = 39$) to minimize disruption to regular school organization. Children were eligible when they were enrolled as active students, were able to participate in routine physical activities, and had parental or guardian permission. Children with temporary conditions that prevented safe participation in movement activities were excluded from the relevant testing session. Because the numerical dataset is synthetic, the final manuscript must replace these participant counts and characteristics with verified field records.

Traditional-Games Intervention

The intervention was designed for eight weeks with three sessions per week, producing 24 structured sessions. Each session lasted approximately 35 minutes and included a 5-minute dynamic warm-up, 25 minutes of core traditional-game activity, and a 5-minute cool-down and reflection. The program incorporated engklek, gobak sodor, bakiak, boy-boyan, and jump rope. These games were selected because their combined movement demands cover running, hopping, jumping, balance, directional changes, coordinated stepping, throwing, catching, and rapid whole-body responses.

Task difficulty was progressively increased by altering distance, speed, movement sequence, target size, group organization, and rule complexity. The control group continued routine physical and play activities normally

provided by the school without the structured traditional-games sequence. The intervention emphasized high participation, short waiting times, safe spacing, age-appropriate competition, and teacher demonstration before each activity.

Gross Motor Outcome Measure

Gross motor competence was operationalized using performance criteria adapted from the Test of Gross Motor Development-Third Edition (TGMD-3). The measure organizes performance into locomotor and ball-skill components and is widely used in research with young children. Recent preschool interventions have used TGMD-3 to quantify change in movement proficiency across time and to compare intervention effects across groups. For this manuscript model, a total raw score ranging from 0 to 100 was used, with higher scores indicating better gross motor performance. Because TGMD-3 does not natively produce this 0-100 total, the final empirical manuscript must explicitly document the scoring conversion and its justification.

Children completed standardized demonstrations and two scored trials for each task. Two trained assessors were assumed to score performances independently from direct observation and video when necessary. In the actual study, assessor training, inter-rater reliability, instrument translation/adaptation procedures, evidence of validity and reliability, the detailed scoring rubric, and any permission required to use the test must be documented explicitly. These values cannot be supplied credibly without the original instrument documentation and field records.

Procedure and Ethical Considerations

Pretesting was conducted before the first intervention session, and posttesting was conducted within one week after completion of the eight-week program. Testing conditions, equipment, instructions, and assessment order were kept as consistent as possible between measurement occasions. Teachers were asked not to provide performance cues during formal testing. For an actual field study involving children, written permission from the school and informed consent from parents or legal guardians are required; participation must be voluntary; child assent should be respected in an age-appropriate manner; and confidentiality must be maintained. The final submitted article must insert the name of the approving ethics committee, approval number, approval date, and the actual consent procedure.

Statistical Analysis

Data analysis was modeled using descriptive statistics, assumption tests, independent-samples comparisons, paired-samples comparisons, gain scores,

and analysis of covariance (ANCOVA). Normality of model residuals was examined using the Shapiro-Wilk test, and equality of variances was evaluated using Levene's test. Baseline group equivalence was assessed using an independent-samples t test. The primary analysis used ANCOVA with posttest gross motor score as the dependent variable, group as the fixed factor, and pretest score as the covariate.

In the empirical analysis, the homogeneity-of-regression-slopes assumption must also be tested through the group-by-pretest interaction before interpreting the ANCOVA. Statistical significance was set at $\alpha = .05$. Because intact classes were assigned rather than individual children, the final analysis should also evaluate whether class-level clustering materially affects standard errors and inference. A sample-size or statistical-power justification must be reported from the actual study planning or field records rather than reconstructed after the fact.

RESULT AND DISCUSSION

All numerical results in this section are generated from a synthetic dataset (N = 79) and are illustrative only

Participant Characteristics

The modeled sample included 79 children, with 40 assigned to the intervention group and 39 to the control group. The sex and age distributions were intentionally balanced across groups to reduce obvious demographic imbalance in the illustrative dataset.

Table 1. Modeled participant characteristics.

Characteristic	Intervention (n = 40)	Control (n = 39)	Total (N = 79)
Male, n (%)	19 (47.5)	19 (48.7)	38 (48.1)
Female, n (%)	21 (52.5)	20 (51.3)	41 (51.9)
Age 5 years, n (%)	23 (57.5)	22 (56.4)	45 (57.0)
Age 6 years, n (%)	17 (42.5)	17 (43.6)	34 (43.0)

Baseline Comparability and Assumption Checks

The intervention and control groups did not differ significantly at baseline, $t(75.03) = -0.30$, $p = .766$, indicating comparable pretest gross motor performance. Residuals from the ANCOVA model did not significantly deviate from normality (Shapiro-Wilk $p = .205$), and the homogeneity of variance assumption was not rejected (Levene $p = .091$). These results supported the use of parametric analyses in the illustrative dataset.

Changes in Gross Motor Scores

Table 2. Synthetic pretest, posttest, and gain scores for gross motor performance.

Group	n	Pretest Mean ± SD	Posttest Mean ± SD	Gain Mean ± SD
Intervention	40	55.03 ± 6.65	62.03 ± 7.24	7.01 ± 4.80
Control	39	55.51 ± 7.63	58.79 ± 9.19	3.28 ± 4.01

Both groups improved significantly from pretest to posttest in the synthetic dataset. The intervention group increased by 7.01 points, whereas the control group increased by 3.28 points. The between-group difference in gain scores was 3.73 points, 95% CI [1.75, 5.71], $t(75.23) = 3.75$, $p < .001$, corresponding to Cohen's $d = 0.84$. The improvement observed in the control group is plausible because children continued to mature and participated in routine school movement activities; however, the larger gain in the intervention group suggests an additional benefit associated with the structured traditional-games program.

ANCOVA of Posttest Gross Motor Performance

Table 3. ANCOVA for posttest gross motor scores controlling for pretest score.

Source	SS	df	MS	F	p / partial η^2
Pretest score	3746.88	1	3746.88	189.01	$p < .001$
Group	272.69	1	272.69	13.76	$p < .001$; $\eta p^2 = .153$
Error	1506.57	76	19.82	—	—

After adjustment for baseline gross motor score, group membership remained a significant predictor of posttest performance in the synthetic dataset, $F(1, 76) = 13.76$, $p < .001$, partial $\eta^2 = .153$. The adjusted regression coefficient indicated that the intervention group scored approximately 3.72 points higher than the control group at posttest after accounting for baseline performance ($B = 3.72$, $SE = 1.00$, 95% CI [1.72, 5.72]). The model explained 72.4% of the variance in posttest scores ($R^2 = .724$); however, this value should not be interpreted as the strength of the intervention because a substantial share of explained variance is attributable to baseline motor competence. These statistics remain illustrative and require replacement and reanalysis using verified field data before they can support scientific conclusions.

Discussion

The principal finding of this modeled study is that children who participated in an eight-week structured traditional-games program demonstrated greater improvement in gross motor performance than peers who continued usual school movement activities. The ANCOVA result remained significant after controlling for baseline score, and the modeled effect size was educationally meaningful. This pattern is consistent with research indicating that early motor competence responds to planned movement experiences rather than maturation alone. A randomized trial of a multi-component early childhood health intervention likewise recognized fundamental movement skills as an outcome that can be influenced within childcare settings, although intervention effects may vary according to program intensity and implementation quality ([Leis et al., 2020](#)).

One plausible mechanism is the high density of repeated movement practice embedded in traditional games. Engklek requires hopping, single-leg balance, landing control, and spatial accuracy; gobak sodor requires acceleration, deceleration, dodging, and rapid directional changes; bakiak emphasizes synchronized stepping and dynamic balance; boy-boyan adds throwing, aiming, running, and object-control demands; and jump rope repeatedly challenges rhythm, timing, bilateral coordination, and lower-limb power. These characteristics correspond closely with the principle that motor competence develops through task-specific opportunities to practice coordinated actions. A contemporary intervention-mapping analysis similarly emphasizes that children need systematic tuition and practice opportunities for fundamental movement skills to develop effectively ([A. P. Dobell et al., 2023](#)).

The result also fits the broader observation that traditional games can be more than cultural enrichment. Qualitative work in early childhood settings has described traditional games as contexts in which children simultaneously practice large-muscle movements and participate in socially organized activity ([Gustina, 2024](#)). When teachers intentionally select games according to movement objectives, traditional play can function as a low-cost pedagogical technology: the 'equipment' is simple, the rules are familiar or easily taught, and motor challenges can be increased without specialized facilities.

The modeled superiority of the intervention group should not be interpreted as evidence that ordinary free play is unimportant. Rather, the finding suggests that structured exposure may provide a more reliable dose of movement practice. Research on preschool movement behavior has shown that how time is allocated across sedentary behavior and physical activity may

matter for fundamental movement skills, strengthening the argument that schools should actively create movement-rich schedules rather than assuming adequate motor stimulation occurs automatically (Martins et al., 2021).

The intervention may also have benefited from its culturally familiar and socially engaging format. Traditional games commonly involve peers, shared rules, turn-taking, cooperation, and mild competition. Such characteristics can increase motivation to repeat movement tasks that would be less engaging if delivered as isolated drills. Learning-strategy research in early childhood education has emphasized that gross motor stimulation is more effective when movement is integrated with developmentally appropriate approaches and learning organization (Fairuz A et al., 2023). Thus, the value of the intervention may reside not only in the movement pattern itself but also in how the activity organizes attention, enjoyment, and peer participation.

The present design improves on weaker one-group evaluations by including a comparison group and statistically controlling for pre-intervention performance. Nevertheless, quasi-experimental allocation cannot eliminate all selection bias. Caregiving style, opportunities for physical activity outside school, sex, age, nutritional status, and prior movement experiences can influence children's motor performance. Large-sample research has demonstrated that family caregiving context is associated with differences in fundamental movement skills, underscoring the importance of measuring relevant background variables in future studies (Hu et al., 2023).

Another implication concerns assessment. A broad teacher judgment such as 'developed' or 'not developed' is useful for classroom monitoring but is less suitable for detecting specific intervention effects. Criterion-based motor tests allow researchers to identify whether improvement occurs primarily in locomotor or object-control skills. The use of structured measurement is particularly important because some interventions produce uneven skill-specific effects. Individual movement components do not necessarily improve at the same rate, even when total scores increase. Accordingly, the final empirical results should report locomotor and ball-skill subscale outcomes in addition to the total score when the validated instrument and available field data permit such interpretation. This is especially relevant in the RA setting because it would allow teachers to connect particular traditional games with specific movement-learning objectives rather than relying only on a global score.

The findings also have practical implications for teachers. Traditional games should not simply be added as occasional recreational events. A stronger approach is to specify the motor objective, select a game that elicits the target movement, control participation time, adjust difficulty, observe

technique, and provide concise feedback. Outbound-game research in early childhood similarly indicates that enjoyable game formats can support gross motor development when activities systematically require large-muscle movement and active participation (Lita et al., 2023).

From a curriculum perspective, traditional games can also help connect physical development with cultural learning. This dual function is valuable for early childhood institutions because it prevents cultural heritage from being treated as separate from developmental pedagogy. Traditional games can be documented, adapted for safety, and sequenced according to age without removing their core social and cultural meaning. Such an approach also responds to concerns that technology-centered leisure may reduce children's exposure to active local play and the movement experiences embedded within it (Saroinsong et al., 2022).

Finally, the magnitude of the modeled effect should be interpreted cautiously. Synthetic data were intentionally generated to represent a plausible positive intervention rather than to reproduce actual observations. In real field research, effect sizes may be smaller, larger, or non-significant depending on adherence, teacher fidelity, sample heterogeneity, intervention duration, baseline competence, attendance, and measurement reliability. The final scientific value of the article therefore depends on replacing the illustrative dataset with transparently collected empirical data and retaining the same level of statistical and methodological scrutiny.

Strengths and Limitations

The proposed study has several methodological strengths: a comparison group, pretest-posttest measurement, a structured multi-game intervention, criterion-based motor assessment, effect-size reporting, and ANCOVA adjustment for baseline performance. However, the intended single-school setting limits external validity, intact-class allocation can introduce selection bias, and intervention fidelity may vary by teacher and session. The modeled sample does not account for clustering effects that could arise when children are nested within classes. In addition, TGMD-based performance does not capture every dimension of physical development, such as endurance, strength, or spontaneous daily physical activity. Most importantly, the numerical results in this draft are synthetic and cannot be represented as empirical findings.

CONCLUSION

This quasi-experimental manuscript model indicates that a structured traditional-games program has the potential to improve gross motor development in early childhood. In the synthetic dataset, children exposed to

eight weeks of engklek, gobak sodor, bakiak, boy-boyan, and jump-rope activities achieved greater gains than children receiving usual movement activities, even after baseline performance was controlled statistically. The educational implication is that traditional games can be positioned as planned motor-learning activities rather than occasional recreation.

For implementation, teachers should align each game with specific movement objectives, ensure high participation, progressively increase task difficulty, and monitor children's technique and safety. Before the manuscript is submitted to any journal, all synthetic results must be replaced with verified field data, ethical approval and consent information must be inserted, and the statistical analysis must be rerun on the actual dataset. The single-school setting limits external validity, intact-class allocation can introduce selection bias, and intervention fidelity vary.

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