# EFFECTS OF KIDABELA MUSIC AND DANCE INTEGRATION ON PRESCHOOL CHILDREN'S LOCOMOTOR SKILLS

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**ABSTRACT**
Locomotor competence is a foundational component of early childhood physical development and can be strengthened through structured, developmentally appropriate movement experiences. This study examined whether the integration of Kidabela music and dance was associated with improved locomotor skills among children aged 5–6 years in Ambon, Indonesia. A quantitative quasi-experimental pretest–posttest control-group design involved 30 purposively selected children from one early childhood education institution, with 15 children in the experimental group and 15 in the control group. The experimental group participated in Kidabela music-and-dance activities for approximately four weeks, with activities lasting about 30–40 minutes, while the control group continued the institution's regular learning activities. Locomotor performance was assessed through an observation rubric covering walking, running, two-foot jumping, repeated jumping with balance, and balance while moving. The reported posttest mean was higher in the experimental group ($M = 85.40$) than in the control group ($M = 70.20$), $t(28) = 6.872$, $p < .001$, mean difference = 15.20, 95% CI [10.67, 19.73], Cohen's $d = 2.51$. The findings indicate a large unadjusted group difference and suggest that culturally contextualized music-and-movement activities may support locomotor performance. However, causal interpretation is limited by the small non-randomized single-site sample, incomplete intervention and measurement documentation, and the absence of a baseline-adjusted analysis.

**Keywords:** early childhood education, local culture, locomotor skills, music-and-movement integration, traditional dance

## INTRODUCTION

Motor competence in the early years is not a peripheral developmental outcome; it is part of the behavioral foundation through which children participate in play, physical activity, and increasingly complex movement experiences. Locomotor skills such as walking, running, jumping, hopping, and moving while maintaining balance are among the core movement patterns that allow children to navigate their environments efficiently. Reviews of the developmental literature associate stronger motor competence with more favorable physical-activity participation, fitness, perceived competence, and weight-related trajectories, while also emphasizing that these relationships evolve over time rather than operating as simple one-way effects (Lubans et al., 2010; Robinson et al., 2015; Barnett et al., 2016). The broader foundational-movement perspective similarly argues that movement competence develops within social, cultural, and geographical contexts and can support later participation in a diverse range of physical activities (Hulteen et al., 2018).

Importantly, fundamental and foundational movement skills should not be treated as abilities that reliably emerge through biological maturation alone. Children require opportunities to learn, practise, receive feedback, and repeat movement patterns under conditions appropriate to their developmental level. Meta-analytic and systematic-review evidence shows that structured motor-skill interventions can improve gross-motor and locomotor competence, although intervention effects vary according to program quality, duration, instructional expertise, and methodological rigor (Logan et al., 2012; Morgan et al., 2013; Wick et al., 2017). A systematic review of randomized controlled trials also found that physical-activity interventions generally support motor-skill development, reinforcing the value of intentionally designed movement experiences rather than relying exclusively on unstructured

exposure (McDonough et al., 2020). These findings are especially relevant to early childhood education, where movement experiences can be embedded in classroom routines rather than separated from the broader learning environment.

Music and dance provide one such embedded context because they combine temporal cues, whole-body movement, repetition, balance demands, and expressive action. A developmentally appropriate music-and-movement program has previously been shown to improve jumping and dynamic balance in children aged 4–6 years, offering direct evidence that rhythm-linked movement can influence motor performance in preschool-aged children (Zachopoulou et al., 2004). More recent work has also shown that music-movement activities can stimulate rhythmic abilities in preschool settings (Laure & Habe, 2024). Beyond early childhood, systematic reviews describe dance as a viable form of structured physical activity with benefits for physical function and health outcomes, while a review focused on children and young people reported generally favorable physical-health associations from recreational dance participation (Burkhardt & Brennan, 2012; Fong Yan et al., 2018). A recent systematic review and meta-analysis focused specifically on preschool children concluded that dance programs can improve fundamental motor skills, particularly body coordination and balance (González-Devesa et al., 2026). Consistent with that conclusion, a randomized trial reported improvements in balance and selected dimensions of motor competence following structured preschool dance programs (Đošić et al., 2025).

The possible value of music-and-dance integration can be understood through an embodied learning pathway. Musical rhythm can provide an external temporal structure that helps organize when a movement begins, how quickly it proceeds, and how repeated actions are sequenced. Dance simultaneously requires the child to coordinate multiple body segments while changing direction, transferring weight, jumping, and stabilizing the body. Repeated practice under rhythmic cues therefore creates opportunities to link auditory information with movement timing, coordination, and postural control. Campbell and Scott-Kassner (2018) describe music learning in childhood as inherently active and embodied, while Goodway et al. (2019) emphasize repeated developmentally appropriate practice in the acquisition of fundamental motor patterns. The value of combining movement with another meaningful learning modality is also supported by evidence that integrated movement-based experiences can enhance preschool motor competence when compared with single-domain activities (Duncan et al., 2019).

Within the Indonesian early childhood literature cited in the source manuscript, several studies similarly report that creative dance, traditional dance, movement-and-song activities, and related rhythmic programs can support gross-motor development. Creative dance has been associated with improved gross-motor performance (Delia & Yeni, 2020), movement-and-song activities have been linked with gross-motor development (Dianti, 2024), and traditional-dance approaches have been used to strengthen movement competence in preschool contexts (Arsila Wigaringtyas & Katoningsih, 2023; Rahmawati & Pamungkas, 2023; Anjarsari et al., 2024; Haida et al., 2024; Triska et al., 2024). These studies are useful for establishing local pedagogical relevance, while the international intervention literature provides a stronger comparative basis for understanding expected motor outcomes and methodological standards.

The present study focuses on Kidabela, which the source manuscript identifies as a traditional dance used in Maluku and characterized by dynamic, rhythmic actions including stepping, turning, jumping, and coordinated arm-and-leg movement. Integrating this dance with musical accompaniment offers a culturally contextualized way to provide repeated movement practice. This cultural feature is pedagogically meaningful, but it is important to distinguish contextual relevance from measured cultural outcomes. The study did not directly assess cultural knowledge, identity, enjoyment, motivation, or cultural preservation; therefore, such

outcomes are not treated as empirical findings. The scientific question addressed here is narrower: whether participation in the Kidabela music-and-dance activities was associated with higher observed locomotor performance.

A gap remains between the broad evidence supporting structured movement interventions and the limited evidence on culturally specific music-and-dance activities used as locomotor-learning media in local early childhood settings. Prior research demonstrates that movement competence is trainable and that dance-based interventions can improve motor outcomes, but the source manuscript identified little empirical work examining Kidabela as a combined music-and-movement activity for children aged 5–6 years in Ambon. The novelty is therefore primarily contextual and pedagogical rather than a claim of a newly discovered universal motor mechanism. The study extends existing work by applying an established movement-development rationale to a locally situated dance form and by quantifying locomotor outcomes using a pretest–posttest comparison. Accordingly, the objective was to examine whether children who participated in Kidabela music-and-dance activities achieved higher posttest locomotor scores than children who continued regular learning activities. The hypothesis was that the experimental group would demonstrate higher posttest locomotor performance than the control group.

## METHOD

### Research Design and Participants

This study used a quantitative quasi-experimental pretest–posttest control-group design. A quasi-experimental approach was appropriate to the source study because full random assignment was not conducted, while pretest and posttest observations were available for an experimental and a comparison group (Creswell & Guetterman, 2018). The study was implemented at one early childhood education institution in Ambon City, Maluku Province, over approximately four weeks. The population comprised children aged 5–6 years enrolled at the participating institution. A purposive sample of 30 children was divided into an experimental group (n = 15) and a control group (n = 15). The source manuscript did not report participant characteristics beyond age and group size, and it did not provide sufficient detail to reconstruct the exact process through which the two groups were formed. Consequently, this revision does not infer randomization, matching, intact-class assignment, recruitment flow, attrition, or missing-data procedures that were not documented in the source material.

### Intervention and Comparison Condition

The experimental group participated in learning activities that integrated Kidabela dance movements with musical accompaniment. The source manuscript reports an intervention period of approximately four weeks and activity durations of approximately 30–40 minutes per meeting, described as occurring across several meetings. The control group continued the institution's regular learning activities without the Kidabela music-and-dance integration. The original records supplied for revision did not specify the exact number of sessions, weekly frequency, movement progression, musical selections, instructor qualifications, group organization, attendance, treatment-fidelity procedures, concurrent motor activities, or possible contamination between groups. These details are therefore not reconstructed in the present article. Their absence is considered when interpreting the findings, because intervention dose and implementation fidelity can influence motor-skill outcomes (Morgan et al., 2013; Wick et al., 2017).

**Outcome Measure and Data Collection**

Locomotor performance was assessed through direct observation using a rubric organized around five movement indicators: walking in time with musical rhythm, running with coordinated body movement, two-foot jumping, repeated jumping while maintaining balance, and maintaining balance while moving from one position to another. Each indicator was rated using a four-level developmental scale: 1 = not yet developed, 2 = emerging, 3 = developing as expected, and 4 = very well developed. The source manuscript reported group means on a scale ranging approximately from 62 to 85, although a five-item rubric scored from 1 to 4 would produce a raw range of 5–20. The score-conversion procedure was not documented in the source material. Therefore, the analyses in this revision use the reported scores as supplied and do not invent or reverse-engineer a transformation formula. The source manuscript also did not report expert validation, pilot testing, inter-rater reliability, internal consistency, observer training, blinding, or procedures for resolving disagreements among observers. These measurement limitations are explicitly incorporated into the interpretation of results.

**Procedure and Data Analysis**

The study procedure consisted of preparation, pretesting, implementation of the learning activities, and posttesting. Both groups completed a pretest observation. The experimental group then received Kidabela music-and-dance activities, whereas the control group continued regular learning. A posttest observation was conducted after the intervention period. The reported statistical analysis was conducted using IBM SPSS Statistics, although the software version was not provided. Kolmogorov–Smirnov tests were used to examine normality and Levene's test was used to examine homogeneity of variance. The principal hypothesis was evaluated using an independent-samples t test comparing posttest scores between the experimental and control groups at an alpha level of .05. To improve interpretability, the present revision reports the mean difference, an estimated 95% confidence interval, and Cohen's d derived from the reported means, t statistic, equal group sizes, and degrees of freedom. These derived statistics supplement but do not replace a baseline-adjusted analysis. Because no ANCOVA, mixed-effects model, or inferential comparison of gain scores was available in the source data, the main result is interpreted as an unadjusted posttest difference rather than as an unbiased causal effect.

**Ethical Considerations**

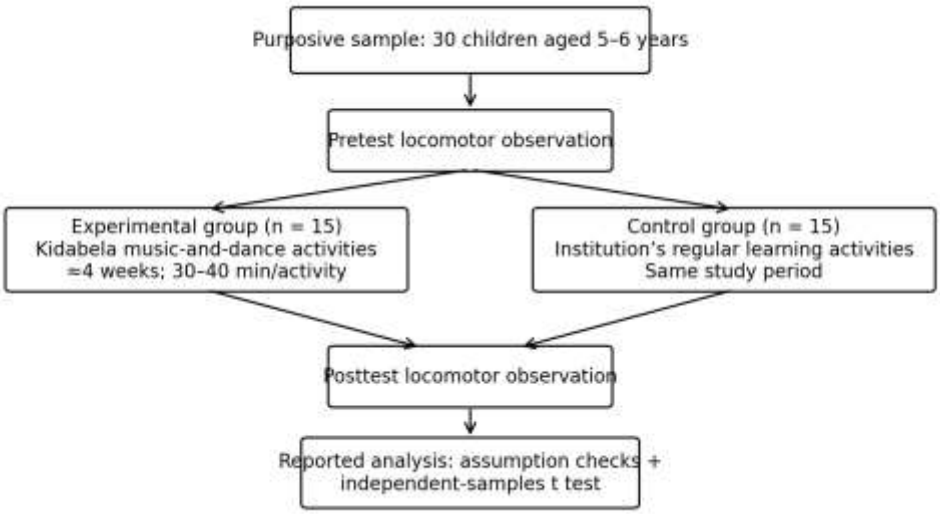


**Figure 1. Research procedure based on the information reported in the source manuscript**

The study involved children aged 5–6 years. The source manuscript provided for this revision did not include a verifiable ethics-committee approval or exemption, institutional permission, parental or guardian informed-consent procedure, child assent procedure, safeguarding protocol, or data-governance statement. These details cannot be ethically inferred or fabricated. Before journal submission, the authors must insert the verified approval or exemption information and accurately describe parental consent, child assent where applicable, confidentiality, movement-safety procedures, and data protection.

## RESULTS AND DISCUSSION

### Descriptive Findings

The reported sample consisted of 30 children, with 15 children in each group. At pretest, the experimental and control groups had similar mean scores descriptively (62.40 and 63.10, respectively). After the intervention period, the experimental-group mean increased to 85.40, whereas the control-group mean increased to 70.20. The corresponding descriptive increases were 23.00 points for the experimental group and 7.10 points for the control group. Table 1 summarizes the reported descriptive statistics. The source table contained a single standard-deviation column with values of 6.25 and 5.80 but did not identify whether these values referred to pretest, posttest, or another derived score; therefore, the values are retained as "reported SD" rather than assigned to a specific time point.

**Table 1. Reported descriptive statistics**

| Group | n | Pretest M | Posttest M | Reported SD* | Mean gain |
|---|---|---|---|---|---|
| Experimental | 15 | 62.40 | 85.40 | 6.25 | 23.00 |
| Control | 15 | 63.10 | 70.20 | 5.80 | 7.10 |

The descriptive pattern is consistent with the study hypothesis: the experimental group showed a substantially larger increase than the control group. Nevertheless, descriptive change alone does not establish that the between-group difference in change is statistically reliable. Standard deviations of change scores and a direct inferential comparison of change were not provided. For that reason, the 23.00- and 7.10-point increases are used as descriptive context rather than as a separate inferential test.

### Assumption Checks and Primary Comparison

The Kolmogorov–Smirnov significance values reported for experimental pretest, experimental posttest, control pretest, and control posttest scores were all greater than .05. The source manuscript interpreted these values as indicating no statistically significant departure from normality. Because each group contained only 15 children, however, the power of a normality test is limited; graphical diagnostics and a Shapiro–Wilk test would have provided additional information. Levene's test was non-significant, $F(1, 28) = 1.213$, $p = .278$, which supports the equal-variance assumption for the reported independent-samples t test.

**Table 2. Reported assumption checks**

| Test / score distribution | Statistic | df | p |
|---|---|---|---|
| Kolmogorov–Smirnov: Experimental pretest | 0.154 | — | .200 |
| Kolmogorov–Smirnov: Experimental posttest | 0.165 | — | .184 |
| Kolmogorov–Smirnov: Control pretest | 0.148 | — | .200 |

| Test / score distribution | Statistic | df | p |
|---|---|---|---|
| Kolmogorov–Smirnov: Control posttest | 0.160 | — | .173 |
| Levene's homogeneity test | 1.213 | 1, 28 | .278 |

The experimental group had a higher reported posttest mean (M = 85.40) than the control group (M = 70.20). The independent-samples t test indicated a statistically significant unadjusted difference, t(28) = 6.872, p < .001. The reported mean difference was 15.20 points. Based on the reported t statistic, equal group sizes, and df = 28, the estimated 95% confidence interval for the mean difference was [10.67, 19.73], and Cohen's d was 2.51. Within the observed sample, this represents a very large standardized difference. It should not, however, be interpreted as a fully adjusted causal effect because group allocation was non-random and the analysis did not control for pretest scores.

**Table 3. Reported posttest comparison and derived effect estimates**

| Exp. M | Control M | Mean difference | t | df | p | 95% CI | Cohen's d |
|---|---|---|---|---|---|---|---|
| 85.40 | 70.20 | 15.20 | 6.872 | 28 | < .001 | [10.67, 19.73] | 2.51 |

## Magnitude and Statistical Interpretation

The size of the reported posttest difference deserves separate attention because statistical significance and educational importance are not the same concept. With equal group sizes of 15 and a reported t value of 6.872, the standardized difference calculated from the available summary statistics was Cohen's d = 2.51. In conventional standardized-effect terminology, this is a very large difference within the observed sample. The estimated 95% confidence interval for the raw mean difference, [10.67, 19.73], also indicates that the posttest separation was not only statistically detectable but substantial on the reported score scale. This pattern is compatible with meta-analytic evidence that well-structured motor-skill interventions can produce moderate to large improvements, particularly when activities provide repeated practice and explicit opportunities to develop locomotor competence (Logan et al., 2012; Morgan et al., 2013; Wick et al., 2017). However, the magnitude in the present study should not be directly compared with standardized effects from validated motor instruments because the source manuscript did not document the score transformation or measurement reliability of its observation rubric.

A very large unadjusted effect in a small quasi-experimental study can reflect both a genuine intervention-related difference and design-specific influences. Sampling variability is greater with small groups, and standardized effects can be inflated when outcome reliability is uncertain or when comparison conditions differ in attention and activity exposure. In addition, the source analysis compared posttest means without adjusting for baseline scores. Although the two pretest means were descriptively close, baseline equivalence cannot be established without pretest variability and participant-level information. For these reasons, the effect estimate is most useful as a transparent description of the strength of the observed group separation, not as proof that Kidabela music-and-dance integration would generate an effect of the same magnitude in another sample. A future study using a validated measure, larger sample, clearly documented allocation, and baseline-adjusted modeling would provide a more stable estimate of educational impact.

**Interpretation in Relation to Previous Research**

The central finding—a higher posttest locomotor score among children who participated in the Kidabela music-and-dance activities—is consistent with a substantial body of evidence showing that motor competence can improve through deliberate, structured practice. Logan et al. (2012) found that motor-skill interventions are effective when children receive opportunities to learn and practise fundamental skills, and Morgan et al. (2013) reported large pooled effects for overall gross-motor proficiency and locomotor competence across youth interventions. In early childhood settings specifically, Wick et al. (2017) found beneficial effects of fundamental-movement-skill interventions on locomotor outcomes among young children in childcare and kindergarten. Although the present study is much smaller and methodologically less complete than the trials synthesized in those reviews, its descriptive direction is consistent with the broader intervention literature.

The music-and-movement structure of the Kidabela activities is also compatible with research more directly related to rhythmic and dance-based learning. Zachopoulou et al. (2004) reported that a developmentally appropriate music-and-movement program improved jumping and dynamic balance among preschool children. Laure and Habe (2024) found that repeated music-movement experiences stimulated rhythmic abilities in preschool settings, supporting the proposition that auditory rhythm can be linked with organized body movement. A recent randomized trial by Đošić et al. (2025) further demonstrated that structured dance programs can improve balance and selected dimensions of motor competence in preschool children. At the synthesis level, González-Devesa et al. (2026) concluded that preschool dance programs can contribute to fundamental motor-skill development, especially coordination and balance. Together, these findings provide a plausible empirical context for the pattern observed in the Kidabela group.

The proposed mechanism should nevertheless be treated as an interpretation rather than a directly measured pathway. Musical rhythm may have helped organize movement timing, while Kidabela movements repeatedly challenged stepping, jumping, direction changes, and balance. This interpretation is consistent with the view that foundational movement skills develop through repeated, context-sensitive practice (Hulteen et al., 2018) and with the broader motor-development framework described by Goodway et al. (2019). Campbell and Scott-Kassner (2018) similarly emphasize the embodied nature of childhood music learning, where listening, timing, and movement are integrated. However, the study did not directly measure rhythmic synchronization, movement kinematics, dose-response effects, attention, or motor-learning mechanisms, so the data cannot determine which specific component of the intervention produced the observed difference.

The result also aligns with a range of dance- and movement-based studies cited in the source manuscript. Creative dance has been associated with gross-motor gains in early childhood (Delia & Yeni, 2020; Haida et al., 2024), while movement-and-song activities have been used to support gross-motor development (Dianti, 2024). Traditional-dance studies likewise report improvements in movement-related outcomes (Arsila Wigaringtyas & Katoningsih, 2023; Rahmawati & Pamungkas, 2023; Anjarsari et al., 2024; Triska et al., 2024). These local studies and the international evidence are not methodologically identical, but together they reinforce the educational premise that dance can provide repeated, engaging opportunities to practise locomotor and stability skills.

The findings also sit within a broader literature on dance and health. Burkhardt and Brennan (2012) found generally positive physical-health associations in their systematic review of recreational dance among children and young people, while Fong Yan et al. (2018) concluded that structured dance can be as effective as, and in some outcomes more effective than, other structured forms of physical activity. Those reviews do not establish that dance is superior for

locomotor learning in preschoolers, but they strengthen the case for dance as a legitimate movement modality rather than merely an enrichment activity. Likewise, Duncan et al. (2019) showed that integrating movement with another meaningful learning domain can benefit preschool motor competence, suggesting that combined or context-rich movement experiences may offer practical advantages when thoughtfully designed.

**Alternative Explanations, Limitations, and Transferability**

Several alternative explanations must be considered before attributing the observed group difference specifically to Kidabela content. The experimental group may have received more total physical-activity time, more adult attention, more repetition, greater novelty, or different peer interaction than the control group. The source manuscript did not quantify the control group's movement exposure or document treatment fidelity. Non-random group formation may also have introduced selection differences that were not captured by the two pretest means. The absence of baseline standard deviations and participant-level data prevents a robust assessment of baseline equivalence, and the use of a posttest-only independent t test does not statistically adjust for pre-intervention performance. These limitations are particularly important because quasi-experimental evidence can overstate intervention effects when allocation and baseline differences are incompletely controlled.

Measurement quality is another major boundary on inference. The observation rubric focused on relevant locomotor and balance behaviors, but the source material did not provide evidence of content validity, construct validity, internal consistency, inter-rater reliability, observer training, or observer blinding. In addition, the conversion from the apparent 5–20 raw rubric range to the reported score scale was not documented. Consequently, the large standardized group difference should be interpreted as a difference in the reported outcome scores, not as definitive evidence of a precisely measured change in an externally validated motor construct. Future studies should use validated locomotor assessments or report rigorous development and reliability evidence for a locally developed rubric.

The sample size and setting further limit transferability. The study involved 30 children from one institution and used purposive selection, so the findings cannot be generalized to all preschool children in Ambon, Maluku, Indonesia, or other cultural contexts. The intervention lasted only approximately four weeks, and no retention test was conducted. Longer interventions and follow-up measurement would help determine whether observed improvements persist. Systematic reviews suggest that structured motor programs can be effective across settings, but they also show considerable heterogeneity in intervention design and study quality (Morgan et al., 2013; Wick et al., 2017; McDonough et al., 2020). The present result should therefore be treated as promising local evidence that requires replication with larger, multi-site samples and more transparent implementation.

Cultural transfer also requires care. Kidabela is meaningful because it is situated within the local context represented in the source manuscript. The appropriate lesson for other settings is not necessarily to reproduce Kidabela without cultural grounding, but to consider how locally meaningful music-and-movement practices can be used to deliver repeated locomotor experiences. The foundational-movement framework explicitly recognizes that the movement skills and practices valued across the lifespan may vary according to cultural and geographical context (Hulteen et al., 2018). Thus, transferability may lie in the pedagogical principles—rhythmic cueing, coordinated whole-body movement, repetition, progression, and cultural relevance—rather than in a universal requirement to use one particular dance form.

**Practical Implications and Future Research**

For early childhood educators, the study suggests that a locally contextualized music-and-dance activity may be used as one option for organizing locomotor practice. Implementation should be developmentally appropriate, adequately supervised, and designed around safe progression from simpler to more demanding movements. Teachers should document session frequency and duration, ensure sufficient space, monitor fatigue and participation, and adapt movements for children with differing motor abilities. International intervention evidence indicates that motor-skill programs are more informative and replicable when the instructional dose, teacher preparation, activity sequence, and assessment procedures are clearly specified (Logan et al., 2012; Morgan et al., 2013; Wick et al., 2017). Therefore, a future Kidabela protocol should be manualized sufficiently for another educator to reproduce it while retaining culturally appropriate flexibility.

Future research should also strengthen both measurement and analysis. Larger multi-site studies should specify eligibility criteria, recruitment flow, allocation procedures, attrition, and missing-data handling. Validated locomotor assessments, trained and preferably blinded raters, and inter-rater reliability estimates would strengthen outcome credibility. Where pretest and posttest data are available, baseline-adjusted ANCOVA or mixed-effects models should be considered rather than relying only on posttest group comparisons. Confidence intervals and standardized effect sizes should be routinely reported. Separate instruments would be required to evaluate outcomes that were not measured here, such as enjoyment, motivation, engagement, cultural knowledge, or cultural identity. Finally, preregistration, transparent analytic syntax, and de-identified data sharing where ethically and institutionally permissible would improve reproducibility and enable stronger comparison with the growing international literature on dance and motor development.

## CONCLUSION

Within a small, non-randomized sample from one early childhood education institution, children who participated in approximately four weeks of Kidabela music-and-dance activities had higher reported posttest locomotor scores than children who continued regular learning activities. The unadjusted posttest difference was statistically significant, $t(28) = 6.872$, $p < .001$, and large in standardized terms (Cohen's $d = 2.51$), a pattern that is consistent with international and local evidence showing that structured movement, rhythmic activity, and dance can support motor-skill development. Nevertheless, the result should be interpreted cautiously because the source study did not fully document group allocation, intervention dose, measurement validity and reliability, ethics procedures, or a baseline-adjusted analysis. Kidabela music-and-dance integration is therefore best viewed as a promising culturally contextualized approach to locomotor learning that warrants more rigorous, transparent, and replicable evaluation before broad causal or generalizable conclusions are made.

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