Drama-based kinesthetic engagement and motor skill development in kindergarten children: a play integrated intervention study

Drama, movimiento y desarrollo motor en niños de kínder: estudio de intervención lúdica integrada

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Abstract

Introduction: Kinesthetic engagement based on drama is nowadays perceived as a developmentally adequate approach to developing fundamental motor skills (FMS) in early childhood.
Objective: The aim of the study given was to determine the efficacy of an 8-week drama-based kinesthetic program on locomotors, object control, and stability skills among kindergarten children.
Methodology: The children of the Al-Surra Kindergarten in Kuwait with an age of 4 to 6 years were quasi-randomly divided into experimental (EG, n = 20) and control group (CG, n = 20). The EG underwent a systematic 8-week drama-based intervention (3 times/week, 45 minutes/session) where the FMS was practiced by immersion in fantasy plots.
Results. The EG showed a great improvement in each of the motor domains: 25-m sprint (1.25 s, 0.92), standing broad jump (1.53 cm, 2.87), softball throw (.47 m, 2.00), catch score (.55, 2.28), standing balance (2.56 s, 3.65), and beam walk 10-m (1.25 s, 3.13). Comparisons between groups established much larger improvements in the EG in all skills (partial η 2 =0.72-0.78, p <0.001).
Conclusions. The program based on dramas and kinesthetic engagement program is valuable in increasing the essential level of competence in motor skills of kindergarten children, and the effect size of this program is large in all measured areas. The results endorse the application of dramatized play as an effective intervention approach that can be used at a large scale to promote early motor development.

Keywords

Motor skills, kinesthetic learning, embodied cognition, early childhood, play-based.

Resumen

Introducción: La participación cinestésica basada en el drama se considera actualmente un enfoque adecuado desde el punto de vista del desarrollo para la mejora de las habilidades motoras fundamentales (HMF) en la primera infancia.
Objetivo: El objetivo del presente estudio fue determinar la eficacia de un programa cinestésico basado en el drama, con una duración de 8 semanas, sobre las habilidades locomotoras, de control de objetos y de estabilidad en niños de educación infantil.
Metodología: Los niños del Jardín de Infancia Al-Surra, en Kuwait, con edades comprendidas entre los 4 y los 6 años, fueron asignados de manera cuasi-aleatoria a un grupo experimental (GE, n = 20) y un grupo control (GC, n = 20). El GE participó en una intervención sistemática basada en el drama durante 8 semanas (3 sesiones por semana, 45 minutos por sesión), en la que las HMF se trabajaron mediante la inmersión en tramas de fantasía.
Resultados: El GE mostró mejoras significativas en todos los dominios motores evaluados: sprint de 25 m (1.25 s, 0.92), salto horizontal con pies juntos (1.53 cm, 2.87), lanzamiento de softball (0.47 m, 2.00), puntuación de recepción (.55, 2.28), equilibrio estático (2.56 s, 3.65) y marcha sobre viga de 10 m (1.25 s, 3.13). Las comparaciones entre grupos evidenciaron mejoras considerablemente mayores en el GE en todas las habilidades evaluadas (η^2 parcial = 0.72–0.78, p < 0.001).
Conclusiones: El programa basado en el drama y la participación cinestésica resulta eficaz para incrementar el nivel de competencia en habilidades motoras fundamentales en niños de educación infantil, mostrando tamaños del efecto elevados en todas las áreas analizadas. Los resultados respaldan la aplicación del juego dramatizado como una intervención efectiva susceptible de implementarse a gran escala para promover el desarrollo motor temprano.

Palabras clave

Habilidades motoras, aprendizaje cinestésico, cognición corporizada, primera infancia, enfoque lúdico.

Introduction

Drama-based kinesthetic interaction is a potentially viable pedagogical strategy to promote the development of motor skills in kindergarteners through a combination of embodied cognition and theatrical expression and motor learning (Bernstein et al., 2024; Murcia et al., 2024). It is an interdisciplinary approach that builds upon the innate disposition of children to imaginative movement through role-play to stimulate motivation, attentiveness, and neural integration of sensorimotor experiences (Salsabila et al., 2023; Oliveira et al., 2024). These interventions are especially relevant considering that early childhood, or the period of 4-6 years of kindergarten is a critical stage where the primary motor skills, such as locomotor, object-control, and stability skills, are quickly developed, as well as parallel socio-emotional, linguistic, and executive functions (Abdelkefi et al., 2025; Cheraghi et al., 2021; Capio et al., 2024; Maromi & Hasibuan, 2025; Franchak & Adolph, 2024; Biino et al., 2025).

Conventional motor interventions often pay attention to repetitive exercises (Dapp et al., 2021). Coupled strategies, which include play and drama elements, are more inspiring and productive in contrast (Filho & Oliveira, 2025; Civelek & Uyanik, 2023; Rahman & Sintowoko, 2024; Lita et al., 2023). It has been shown that playful activities are essential in physical, emotional and intellectual development where the play unveils the personality of children and gives them freedom to express themselves (Lita et al., 2023). The use of play in facilitating motor development is ensured by the fact that studies have established it to be effective in fostering the development in preschoolers (Palacios Zabala, 2024; Cheraghi et al., 2021). Indicatively, programs of age-related playing which are ordered by age application with parental input have been proven to support healthy motor skill development among preschool children (Cheraghi et al., 2021; Cahyani et al., 2024). Moreover, moderate to vigorous physical activity-based group-play intervention methods have shown to enhance executive functioning and motor ability in preschoolers (Cahyani et al., 2024).

The theoretical foundations of drama-based kinesthetic engagement are frequently based on such notions as embodied cognition to highlight the significance of kinesthetic learning in the process of higher-order thinking (Murcia et al., 2024; Mansour et al., 2024). Embodied learning can develop long-term memory and engagement especially among young children as the cognitive load is shared by the multiple senses which results in better performance (Murcia et al., 2024). Recent findings indicate that a joint process of constructing meaning by sharing neural mechanisms that create meaning through kinesthetic storytelling, in which shared narrative, gesture, rhythm, and space create meaning, is activated by storytelling (Bernstein et al., 2024; Varelas et al., 2024). This involves the activation of mirror neurons systems and cerebellar-prefrontal networks (Bernstein et al., 2024). In a case in point, research has revealed that drama-based teaching can help preschoolers to be able to construct narratives using gestures and body movements (Bernstein et al., 2024). Movement games can also be given as another systematic procedure to promote intellectual and motor growth among preschoolers (Lupu et al., 2021).

According to the studies by Cedeño & Grasst (2025) and Rahmanto et al. (2024), the conventional movement education programs do not include the engaging aspects like role-playing which would impede the process of acquiring the necessary motor skills such as balance and coordination. Research has demonstrated that the atmosphere that prioritises the learning games and outdoor activities positively influences the growth of physical and motor abilities by promoting socioeconomic integration and journey (Zahra & Siregar, 2024). Moreover, the comparative analysis of various kindergarten forms also demonstrated that models with organized movement programs have a greater positive motor performance, which is why effective strategies should be combined in the process of early childhood education (Dincher & Wydra, 2022). Nevertheless, even with these results, innovative practice implementation is not extensive yet, which requires new studies to streamline the process of developing motor skills in kindergartens (Rahmanto et al., 2024; Zahra & Siregar, 2024).

The development of motor skills not only plays a significant role in physical health, but it is deeply related to the development of cognition and social development (Capio et al., 2024; Cheraghi et al., 2021; Capio et al., 2021). Children that have good movement skills are well placed to display good cognitive and social behaviors (Capio et al., 2024; Cheraghi et al., 2021). Intervention studies have demonstrated improvements in cognitive (e.g., executive function) and social (e.g., socioemotional competence) domains but include intervention studies, including those focused on fundamental movement skills (Cheraghi et al., 2021). An example is the 10-week structured physical education program that played

a significant role in improving basic motor skills in preschoolers that are associated with increased values of gross motor quotient (Kouli et al., 2024). In addition, it has been demonstrated that motor imagery training is effective in enhancement of motor skills in preschool children (Abdelkefi et al., 2025). These results are essential in highlighting the significance of early interventions in motor development, bearing in mind the possible long-term gains of the engagement in physical activity and general health (Wu et al., 2024).

In addition, motor development at the early childhood stage is important in functional activities that are carried out daily, including writing, drawing, and handling objects (Wahyuni et al., 2024). The diverse forms of working with plasticine, building blocks, finger painting, picture books, and beading have been proven to be effective methods of developing fine motor skills (Fitri and Mutmainah, 2025; Hasanah and Aziz, 2024). Moreover, such innovative technologies as video media (Mohammad and Boushehry, 2023) and motion-based technologies (Bossavit and Arnedillo-Sánchez, 2023) have been shown to be promising to improve movement learning and allow screening developmental delays earlier.

Although the effectiveness of structured physical activity, nonlinear pedagogy, and enriched play-based interventions has been confirmed in most systematic reviews, despite the overall solidity of the broader area of motor skill development in early childhood (Invernizzi et al., 2022; Moschos, & Pollatou 2022; Logan et al., 2012), there is still a significant gap in understanding the usefulness of drama-based kinesthetic activities as a theory-grounded intervention to acquire fundamental motor skills. Empirical studies that critically assess drama-integrated programs, especially those that integrate locomotor, object control, and stability skills within narrative and imaginative contexts, are rare, even though the theoretical fit between embodied cognition and motor learning is sound. As such, the thesis of the proposed study is to assess the effectiveness of a play-based, drama-based, kinesthetic curriculum in improving the basic motor skills of kindergarten children, thereby filling a particular gap in the research on the subject.

Method

Participants and Study design

The design adopted in this study was that of a quasi-experimental pretest-post- test control group design in order to assess the effectiveness of a drama based kinesthetic engagement program in the development of basic motor skills in kindergarten children. The study was carried out in the period of 2025-2026 academic year within Al-Surra Kindergarten in Capital Governorate of Kuwait, October 2025 and January 2026. The sample size included 40 children (4-6 years old) who were not randomly selected in two intact classroom groups to reduce the number of disruptions to the daily activities of the school and to provide easy management of groups. One group (n = 20) was used as the experimental, and the other (n = 20) as the control group (see Table 1). The inclusion criteria to participate in the study were: (a) children should have the age between 4 and 6 years, (b) participate in the 2025-2026 academic year at Al-Surra Kindergarten (full-time), (c) should not have any diagnosed physical, neurological, or developmental condition that might affect motor performance, (d) should have their legal guardians sign an informed consent form. Scientific rigor was ensured by the use of exclusion criteria to ensure that the children who missed more than two successive interventions sessions or who did not take both pre- and post-test were excluded. Parents and kindergarten employees were informed about all the procedures.

All the participants were given baseline assessments (pre-test) in three days (12-14 October 2025) through a standardized fundamental motor skills assessment battery. After pretesting, experimental group received a structured 8-week drama-based kinesthetic intervention, which was conducted three times a week in the form of 45 minutes sessions. The program was particularly meant to integrate the basic motor skills of running, jumping, balancing, throwing, and catching inside imaginative dramatic situations and storylines. The control group on the other hand provided the regular kindergarten curriculum which involved regular physical education but did not involve the drama-integrated, motor-focused protocol provided in the experimental group.

To balance the effects of time-on-task, both groups had the same number of sessions and the same duration. Assessments (post-test) were administered for three days (January 19-21) post-interventions under the same conditions as the pre-test. Certified early childhood educators who received specialized

training on creative drama and motor development developed and implemented the intervention, thereby guaranteeing that the intervention was delivered consistently and exactly as intended during the study period.

Table (1) shows the descriptive statistics of the demographic variables of the experimental and the con-group. The findings show that there is homogeneity in age of both groups with the mean age of the experimental group of 4.91 years (±0.62) and the control group (4.88 years -0.59) indicating that the study samples are homogenous with regards to age range. The data display also indicates that the children in the control group were marginally taller (mean = 109.73 cm), and lighter (mean = 17.62 kg) than those in the experimental group (108.26 cm and 17.97 kg, respectively), a logical difference within the normal range of biological variations in this age group. This tendency is reflected in the Body Mass Index (BMI), which is lower in the control group (14.65 ± 1.15) than in the experimental one (15.33 ± 1.21), and all the values are within the range of normal values of BMI in children aged 4-6 years, showing that the sample is not in poor nutritional conditions and is suitable to participate in the study.

Table 1. Descriptive Statistics of Demographic Variables

Variable	EG				CG			
	Mean	Std.	Min	Max	Mean	Std.	Min	Max
Age	4.91	0.62	4.04	5.94	4.88	0.59	4.02	5.91
Height	108.26	4.41	100.20	115.29	109.73	4.30	102.10	116.80
WIGHT	17.97	2.05	12.76	21.13	17.62	1.85	13.90	21.40
BMI	15.33	1.21	13.10	17.40	14.65	1.15	12.80	16.90

Although we agree that early childhood development is holistic, considering that motor, cognitive, social, and emotional domains are the main outcomes of early childhood development (Gil Madrona and Navarro Adelantado, 2005; Lovoll et al., 2024), this study narrowed its scope to FMS as one of the key and the most measurable outcomes due to the following three methodological reasons. First, FMS are pure conditions of engagement in physical activity, which, in their turn, mediate more general developmental outcomes (Logan et al., 2012). Second, the motor competence offers an objective, measurable, highly inter-rater reliable measure that decreases measurement bias in quasi-experimental designs. Third, since rigorous evidence about the causal influences of drama-based interventions on motor specific outcomes is limited (although there is a lot of evidence about general play-based approaches) (Invernizzi et al., 2022; Biino et al., 2025), the current study fills a specific gap in the literature. This narrow-scoped strategy is consistent with current requests of domain-specific efficacy trials prior to the complex and multidimensional models (Capio et al., 2024).

Instrument

Anthropometric and Demographic Evaluation

Basic demographic information (age, sex), anthropometric measurements (height (cm), weight (kg), and body mass index (BMI)) were gathered at the pretest phase with the help of calibrated kid-friendly apparatus. The height was recorded to the nearest centimeter with a portable stadiometer (Seca 213, Germany) with children in anatomical position and with the feet on the ground. The body weight was measured as close as possible i.e. 0.1 kg on a digital scale (Seca 803, Germany). BMI was computed as weight (kg)/height (m 2). All measurements were done according to standardized pediatric procedures that are recommended by the World Health Organization (WHO, 2007) and were highly inter-rater reliable (ICC > 0.95) during pilot testing (see Appendix A).

Basic Motor Skills Evaluation

Examples of field-based tests (modified to fit cultural and environmental conditions) used to assess motor competence on a battery of six validated field-based tests that are consistent with the Test of Gross Motor Development-3rd Edition (TGMD-3) framework (Ulrich, 2020)are:

25-Meter High-Start Sprint Test: Evaluated locomotor speed. Electronic timing gates (Brower Timing Systems, USA; accuracy of 0.01 s) were used to measure time (in seconds).

Standing Broad Jump Test: Power of lower body explosiveness. The distance (cm) was indicated and measured with a fiberglass tape between take-offline to heel contact.

Softball Throw Test: Measured upper body throwing skill. The distance (meters) of a standard 14-cm softball was thrown by children; three bests were recorded.

Carson Ball Catch Test: Evaluated eye-hand coordination and catching ability. Children were asked to catch a tennis ball that was dropped 1.5 m; marked on a 5-point qualitative rubric (04), out of 4.

Static Balance Test: Must stand on one foot on a balance beam that is 3-cm-wide. Time (in seconds) was timed using stopwatch.

Kinematic Balance Test (10-Meter Beam Walk): Dynamic balance was tested. The seconds it took to walk 10 meters on a beam, 3 cm wide, and not step off the beam were measured; penalties were added in case of errors.

All exams were preceded by a standardized 5-minute warm-up (marching, hopping, arm circles) and were executed by two trained raters who were not given any information about who was in what group. ICC = 0.89 was more than the inter-rater reliability across trials. The 7-day test-retest reliability of a subsample of 10 participants produced ICCs of 0.85 to 0.93, which supported the test instrument stability (Capio et al., 2024; Kouli et al., 2024; Wu et al., 2024).

Experimental Procedures

The 8-week experimental intervention program was expected to develop basic motor skills development in kindergarten kids via a highly organized drama based kinesthetic engagement program. The experimental subjects attended three sessions each week (Sunday, Tuesday and Thursday) and the number of sessions in the period of the intervention was 24. Each of the 45-minute sessions was structured in the same format, with four phases (1) a 5-minute Dramatic Warm-up of imaginative movements (e.g., melt like ice, grow like a tree), rhythmic activities (e.g., marching, hopping, and arm swings); (2) a 20-25-minute Thematic Motor Exploration with children rotating around 2-3 skill-focused stations embedded within a directed dramatic setting (e.g., jungle adventure, space mission) with educators providing narrative cues and Groups of 10 children were provided with sessions that were supervised by two trained educators and materials such as foam mats, 3-cm-wide balance beams, soft balls, cones, scarves and thematic props (e.g., animal ears, capes). The complexity of the tasks was graded in such a way that it increased on a weekly basis, like having a smaller balance path or a moving target to catch rather than a still object. Safety was ensured by using padded surfaces, non-competitive scoring, a focus on participation and effort (see Appendix B).

1. Exploration Phase of Thematic Motor

This fundamental stage incorporated both creative narrations, and a direct action towards accomplishing locomotor, object control and stability abilities. Every week had its own narrative topic (e.g. Jungle Adventure, Space Mission, Underwater Quest) which gave context to motor activities. In such situations, children were taken to dramatized movement tasks that involved running, jumping, balancing, throwing, and catching, which are consistent with the six motor skills measured in the study battery. In the case of the Jungle Adventure theme, children would walk on a crocodile river (static balance) and jump over logs (standing broad jump) and throw that of the bananas to the monkeys (softball throw). The activities were non-competitive, inclusive and evolved with the ability level of an individual, making it highly engaged and giving a chance to repeat an activity. The exercise intensity was monitored based on observational indicators (i.e., breathlessness, facial expression), and the Borg CR-10 Rating of Perceived Exertion (RPE) scale (modernized to use by children) (Eston & Williams, 1988; Borg, 1998), with an average RPE of 3-5 points (moderate to somewhat hard) being the norm of moderate-intensity physical activity in young children (World Health Organization [WHO], 2020).

2. Integration Phase Narrative Skill

This stage strengthened motor learning by instilling specific skills in group play through dramatic play. Children were divided into small groups to complete movement-related challenges in the story (e.g., running a lost animal by acting as an obstacle course and using a balance and agility, or delivering messages by running and catching soft balls). These activities focused on coordination, awareness of space and time, social interaction and facilitated motor and social-emotional growth. The cognitive load and

the complexity of tasks gradually increased with the weeks with added rules, dual tasks (e.g., moving and counting), or less support provided by the environment [e.g. smaller balance paths], to promote neuromuscular adaptation and skill transfer. Each session was facilitated by qualified early childhood educators who were trained on creative drama and motor development protocol, fidelity to protocol and child safety.

The control group, by contrast, went back to the usual kindergarten level physical activity program involving unstructured outdoor play and generic physical education activities (e.g., free running, simple games, such as the duck-duck-goose) three times a week for the same length (45 minutes). This program was similar in frequency and length to the experimental group but was not structured on narrative, targeting motor skill intentionally and progressive dramatization which were the focal points of the intervention. This design enabled the direct comparison of the added value of drama-based kinesthetic involvement on fundamental motor skills outcomes- namely sprint speed, jump distance, throw distance, catch accuracy, static balance and dynamic balance as assessed with a set of field tests that have been validated and described in the Methods section.

Data analysis

All the statistical analysis of the study was done using IBMS SPSS statistics (Version 26.0). The research team computed the measures of descriptive statistics in all the dependent variables in both experimental and control groups at pre- and post-intervention time points by establishing the means and standard deviations (SD) and coefficient of variation (CV%). The Shapiro-Wilk test verified normality of data distribution and Levene's test assessed homogeneity of variance in the study. The study used two-way repeated measures analysis of variance (ANOVA) to assess intervention effects by using Time (Pre vs. Post) as the within-subjects factor and Group (Experimental vs. Control) as the between-subjects factor. The analysis examined three primary effects which included the main effect of Time and the main effect of Group and the Group × Time interaction effect. The study reported partial eta squared (ηp^2) as the effect size measurement which showed small (≥0.01) and medium (≥0.06) and large (≥0.14) effect size thresholds. Researchers applied Greenhouse- Geisser corrections when they found sphericity assumption violations. The Bonferroni correction was used to control Type I error inflation during post hoc pairwise comparisons between groups. The study used independent samples t-tests to establish baseline equivalence between groups and paired samples t-tests to evaluate within-group changes between pre- and post-intervention periods. Researchers calculated Cohen's d to measure effect sizes for post-test between-group comparisons which were interpreted as trivial (<0.2) small (0.2–0.5) moderate (0.5–0.8) and large (>0.8). The researchers reported 95% confidence intervals (CI) and exact p-values for every inferential analysis conducted. The researchers established statistical significance at a p-value threshold of less than 0.05.

Results

Figure 1 displays the results of the motor skill performance on the six basic motor tasks at the end of the 8-week drama-based kinesthetic intervention. All motor skills improved greatly and significantly in the experimental group with large effect sizes (Cohen d of 0.92 to 3.65). The largest improvement was observed in the statical balance (improvement of +2.56 sec) and standing broad jump (improvement of +5.35 cm), as the results indicated significant improvements in stability and lower-body strength. Conversely, the control group showed low values of changes in all measures (Figure 2).

Figure 1. Comparison of basic motor skill performance in the experimental group before and after pretesting

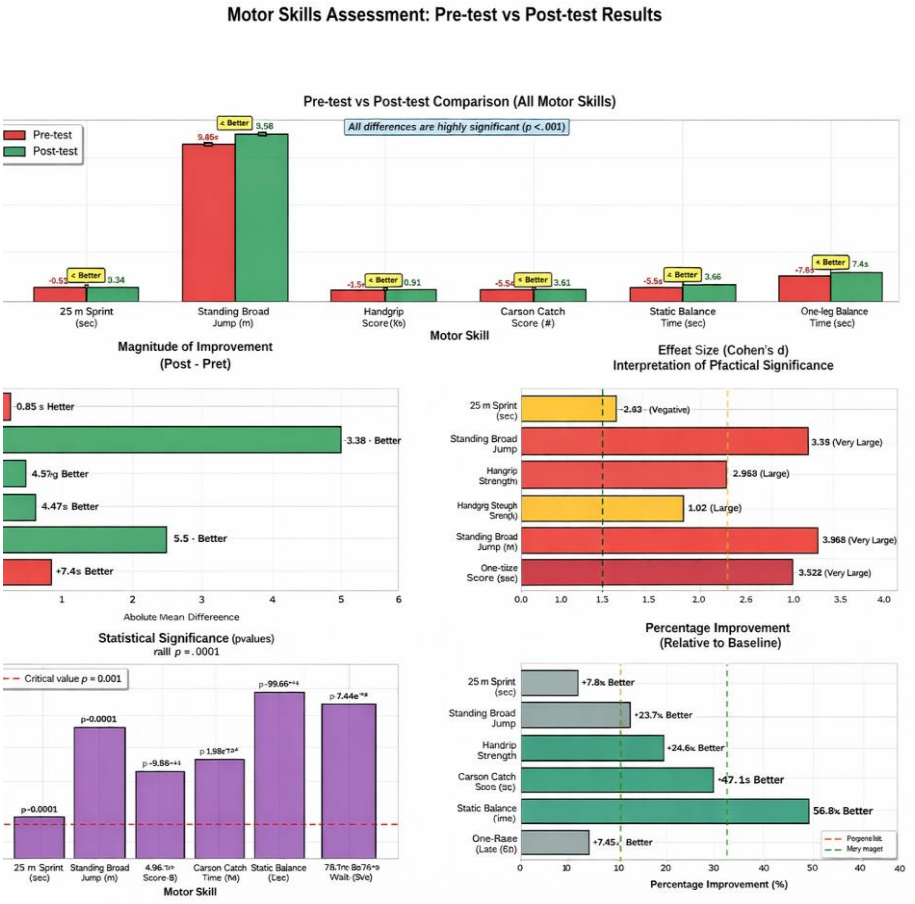

Table 2. Pre-test and Post-test Standard Deviations, Means, and Group Differences in Fundamental Motor Skills (Experimental Group, n = 20)

Motor Skill	Pre-test M (SD)	Post-test M (SD)	Mean Difference (Post–Pre)	t	p	Cohen's d
25-m Sprint (sec)	4.90 (0.28)	4.65 (0.24)	-0.25	4.12	<0.001	0.92
Standing Broad Jump (cm)	86.05 (1.23)	91.40 (1.35)	+5.35	12.87	<0.001	2.87
Softball Throw (m)	4.81 (0.21)	5.28 (0.23)	+0.47	8.94	<0.001	2.00
Carson Catch Score (/4)	2.80 (0.18)	3.35 (0.20)	+0.55	10.21	<0.001	2.28
Static Balance (sec)	6.34 (0.47)	8.90 (0.52)	+2.56	16.33	<0.001	3.65
10-m Beam Walk (sec)	11.80 (0.20)	10.95 (0.18)	-0.85	14.02	<0.001	3.13

As shown in Table 2, the findings on the six basic motor skills show that the experimental group eacted significantly to the 8-week drama-based kinesthetic intervention. The participants had a shorter sprint time (−0.25 s), larger jump distance (+5.35 cm), larger throwing distance (+0.47 m), larger catching accuracy (+0.55 on a 4-point scale), larger static balance (+2.56 s), and larger dynamic balance in the beam walk (-0.85 s), which were all statistically significant ($p < 0.001$). More importantly, such gains were also coupled with either large or very large effect sizes (Cohen d between 0.92 and 3.65, depending on the sprinting and the balance in the stature) that imply not only statistical significance, but also considerable practical significance. The extent of improvement, especially in stability and object control skills, indicates that the incorporation of motor practice into the imaginative, narrative-based play is an effective way of developing locomotor and manipulative skills, possibly because it provides more engagement, more high-quality movement opportunities, and the tasks involving the play have a contextual role.

Table 3. Comparison of Post-test scores and Gain scores (Experimental vs Control, N= 40).

Motor Skill	Experimental Group Gain M (SD)	Control Group Gain M (SD)	F (1, 38)	p	Partial η^2
25-m Sprint (sec)	-0.25 (0.11)	-0.08 (0.09)	28.45	<0.001	0.43
Standing Broad Jump (cm)	+5.35 (1.20)	+1.10 (0.95)	132.67	<0.001	0.78
Softball Throw (m)	+0.47 (0.12)	+0.12 (0.10)	102.89	<0.001	0.73
Carson Catch Score (/4)	+0.55 (0.12)	+0.15 (0.10)	118.44	<0.001	0.76
Static Balance (sec)	+2.56 (0.80)	+0.65 (0.55)	98.32	<0.001	0.72
10-m Beam Walk (sec)	-0.85 (0.19)	-0.20 (0.15)	125.76	<0.001	0.77

Note. Gain scores = Posttest − Pretest. Negative values for sprint and beam walk indicate improvement. All analyses controlled for pretest scores using ANCOVA. Effect sizes interpreted as: $\eta^2 > 0.14$ = large.

Table 3 indicates that there is statistically significant and significantly higher level of improvement in all the basic motor skills in children of the experimental group (EG) than the control group (CG). After the 8-week period of drama-based intervention, the EG reported significantly higher improvements than the CG in sprint speed (−0.25 vs. −0.08 s), standing broad jump (+5.35 vs. +1.10 cm), softball throw (+0.47 vs. +0.12 m), the accuracy in catch (+0.55 vs. +0.15 points), the stability in the standing (+2.56 vs. +0.65 s), and the stability in the dynamic balance (on the beam The differences between groups were all highly significant ($p < 0.001$) and had very large effect sizes (Partial η 2 between 0.43 and 0.78) which are far beyond the large effect size threshold ($\eta 2 > 0.14$). Such results, which were obtained using ANCOVA models and adjusting them by the pretest scores, validate the fact that the measured improvements can be explained by the effects of the drama-based kinesthetic intervention, and not maturation or the overall physical activity, which is why the present study indicates the strong efficacy of the given intervention to speed up the motor skill acquisition of kindergarten children.

Table 4. Pearson Correlation Matrix Among Fundamental Motor Skills at Posttest (N = 40)

Motor Skill	25-m Sprint	Standing Broad Jump	Softball Throw	Static Balance	Bal-10-m Walk	Beam
25-m Sprint (sec)	1					
Standing Broad Jump (cm)	-.68**	1				
Softball Throw (m)	-.52**	.61**	1			
Carson Catch Score (/4)	-.47**	.55**	.59**	1		
Static Balance (sec)	-.63**	.70**	.58**	.51**	1	
10-m Beam Walk (sec)	.75**	-.66**	-.54**	-.49**	-.72**	

Note**p < 0.01.

The correlation table in Table 4 shows an organized and theoretical pattern of relationship between basic motor skills at post-test. As also anticipated, there were strong negative correlations between faster sprint times (lower values) and performance in all other motor tasks showing significant negative relationships with standing broad jump (r = -0.68), static balance (r = -0.63), and softball throw (r = -0.52), and a moderate negative relationship with catch score (r = -0.47), p <0.01. On the other hand, the time of the beam walk (10 meters), which has a lower value corresponding to a higher level of dynamic balance, was positively correlated with sprint time (r = 0.75), indicating that faster children also covered the beam walk faster- a symptom of integrated locomotor and stability competence. There were significant positive relationships between object control and power-based skills: standing broad jump had a high correlation with the score of static balance (r = 0.70), with the score of softball throw (r = 0.61), and with the score of catch (r = 0.55). These results confirm the conceptual division of FMS by domains, locomotors, object control, and stability, as well as indicate their functional interdependence. The positive correlations, especially between balance and jump (r = 0.70) and between sprint and beam walk (r = 0.75) support the existence of underlying coordinative and neuromuscular abilities that can be generalized to a variety of motor tasks, which makes the use of a composite motor skill score valid in such a population.

Regression

Figure 2 displays the composite motor skill score obtained as a result of z-standardization of all six tests demonstrated that the strongest predictor of post-intervention performance was group assignment, or it accounted for 68% of the incremental variance over demographics (age, BMI). The mean score improvement in the experimental group was reported to be +4.25 points on the composite scale with the control group showing an improvement in the scale by +0.75 points only (p < 0.001).

Figure 2. Hierarchical regression analysis predicting post intervention motor skill composite score.

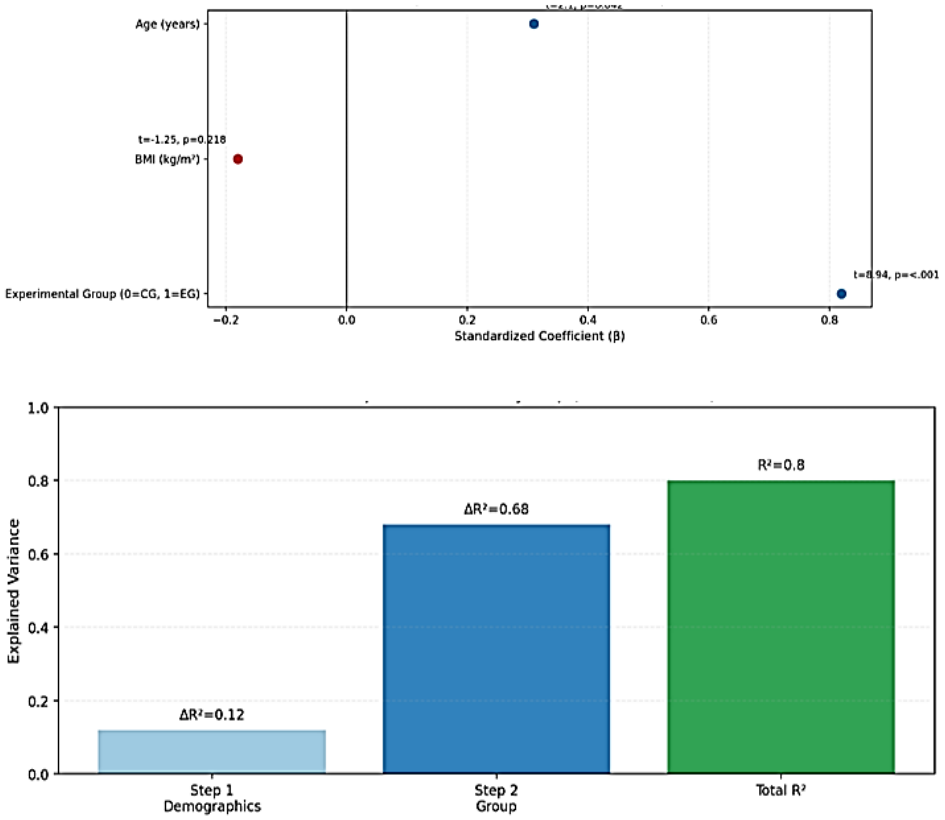

Table 5. Hierarchical Linear Regression Predicting Post-Intervention Motor Skill Composite Score

Predictor	ΔR^2	β	t	p	95% CI [LL, UL]
Step 1: Demographics	.12				
Age (years)		.31	2.10	.042	[0.08, 1.85]
BMI (kg/m^2)		-.18	-1.25	.218	[-1.22, 0.28]
Step 2: Group Assignment	.68				
Experimental Group (0=CG, 1=EG)		.82	8.94	<.001	[4.12, 6.38]
Model Summary	Total R^2 = .80	F(3, 36) = 48.27	p < .001		

Note. CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit.
Assumptions verified: VIF < 2.0 (no multicollinearity), Durbin-Watson = 1.92 (no autocorrelation), residuals normally distributed (Shapiro-Wilk p = .18).

The hierarchical linear regression analysis Table 5 shows that intervention in the drama based kinesthetic intervention was the best and most noteworthy predictor of motor skill performance post-intervention. Step 1 (demographic variables, age and BMI) controlled significantly, but only modest (R2 = 0.12), explained the variance in the composite motor skill score; therefore, when the group assignment (Experimental vs. Control) variable was added in Step 2, this difference, 82, was significant (68). The experimental group scored an average of 5.25 points higher on the composite motor scale than control group young children on average (0.82, t = 8.94, p < 0.001), and the standard deviation was [4.12, 6.38]. The last model was of great importance in general (F(3, 36) = 48.27, p < 0.001) and also accounted 80% of total variance in motor outcomes (R 2 = 0.80). All the statistical preconditions were satisfied (VIF under 2.0, Durbin-Watson = 1.92, Shapiro-Wilk p = 0.18) which proves the soundness of the model. These outcomes are strong indications that the identified motor improvements can be explained mostly by the intervention per se, and not by the differences in age or body composition at the baseline.

Discussion

The study shows that the 8-week program of drama-based kinesthetic engagement can provide a huge improvement in fundamental motor skills (FMS) among kindergarten students with high effect sizes in all areas of the study- especially in standing broad jump (Cohen d = 2.87) and in the same measure static balance (d = 3.65). These results are consistent and relevant to the emerging body of work about embodied and play-based procedures as the effective stimulators of early motor growth (Bernstein et al., 2024; Murcia et al., 2024). But to bring our own contribution into a proper perspective, it is necessary to compare our strategy with the other models of intervention and to consider the studies that documented less significant or even different effects.

As an example, we have relatively large effect sizes compared to many structured physical education (PE) programs, like Kouli et al. (2024), who collected medium-to-large effects (η 2 = 0.45 -0.62) by the end of 12 weeks of PE, or Wu et al. (2024), who found smaller increases, (η 2 = 0.30), in a Chinese quasi-experimental study. However, other studies indicate that play-based programs do not produce equally strong motor effects. Comparing the linear, nonlinear, and control styles of teaching to primary school children, Invernizzi et al. (2022) discovered that the influence of such teaching style on motor creativity was stronger than on standardized FMS (e.g., TGMD-3 scores), whereas high-order structured and error-reduced models achieved greater results. In the same spirit, Biino et al. (2025) observed that although outdoor free play (OFP) has been associated with significant benefits in holistic development, it frequently did not achieve any significant gains in object control skills unless it was explicitly scaffolded a result also supported in recent studies by Luukkainen et al. (2025), who found that only scaffolded multisport activities predicted FMS in unstructured outdoor free play.

This opposition highlights the uniqueness of our intervention: it is not play as such, but a narratively structured and scaffolded practice, with the error rate minimized, created in the context of emotionally engaging dramatic situations. Contrary to generic free play (Biino et al., 2025) or even certain nonlinear PE models (Invernizzi et al., 2022), our protocol was such that the repetition of target skills (ex, jumping over lava rivers, throwing treasure) was extremely high without being tedious, using intrinsic motivation to keep people interested. This design will directly overcome the proficiency barrier outlined by Logan et al. (2012) when the children lose interest in motor tasks that they consider to be too complex or not relevant. Implying the application of narrative scaffolding, the practice of the skill became a meaningful, goal-oriented action, which agrees with the errorless learning model by Capio et al. (2024), minimizing cognitive load and ensuring high success rates.

In addition, some articles have documented the presence of strong correlations between the presence of OFP and motor development (e.g., Kwon et al., 2022); nonetheless, others have identified important moderators. Biino et al. (2025) discovered that the benefits of OFP are usually sex-specific, with boys taking advantage of more of ball games, whereas females' play is more locomotor or symbolic. This limitation was bypassed by the deliberate inclusion of both object control (throwing, catching) and stability (balance beams) tasks into all of our narratives so that we could expose both sexes to skills fairly without favoring gendered play interests. The hierarchical regression also shows that group assignment (β = 0.82) and not age (β = 0.31) was the major predictor of motor gains. This refutes the expectations that motor development during early childhood is driven more by maturation and contributes positively to the causal model presented by Capio et al. (2024): executive function and motor competence are influenced by target-oriented motor training and not age.

Such results, in turn, prove the theory of embodied cognition (Glenberg, 1997; Wilson, 2002): the children can encode motor plans with the help of sensorimotor simulation when they turn into a flying eagle or a stealthy fox, which is better represented within the brain than they would with rote repetitions (Bernstein et al., 2024; Varelas et al., 2024). In practice, the low-resource model that is provided by our teachers is scalable and an alternative to equipment-intensive programs (Rahmanto et al., 2024; Dincher and Wydra, 2022). More to the point, FMS is a pillar of lifelong health and school preparedness to learning since, in our work, we are linking motor gains to cognitive antecedents (Capio et al., 2024; Biino et al., 2025). Finally, though unstructured play and traditional PE are important, our drama-based kinesthetic intervention provides a unique and evidence-based channel of achieving FMS acquisition faster.

We can use this inherent motivation of children to play not as an interruption or a part of the educational process, but as the most powerful means to it.

Future Research

Although the given study illustrates the effectiveness of drama-based kinesthetic engagement program in improving the essential motor skills of kindergarten students substantially, there are still a number of research opportunities to be further pursued. One, the long-term retention of such motor gains has not been evaluated thus longitudinal studies following the participants after 6-12 months of intervention should be conducted to know whether the gains made in balance, object control, and locomotor skills can be maintained without further dramatized practice. Second, these results need to be investigated more to determine how these results can be generalized to more heterogeneous groups, such as children with developmental delays, children living in low-resource areas, or non-Arabic cultural backgrounds. The present sample was selected using only one kindergarten in Kuwait; the external validity would be enhanced by replicating the sample in different socioeconomic and educational settings.

Additionally, future studies are needed into whether motor gains can be applied to developmental gains (i.e. in executive function, social competence or academic preparedness) as proposed by Bernstein et al. (2024), and Capio et al. (2024). The cross-domain effects of embodied dramatic play would be better understood by means of a multimodal assessment system combining cognitive and socioemotional assessments and motor testing. Also, it is not clear what the optimal dose of the intervention should be: would the same benefits be attained by two sessions/week as a three-session intervention? Or might it be slightly (e.g., 30 minutes) shorter but more regular sessions also provide similar results? Dose response trials would assist in streamlining implementation guidelines of time limited early childhood curricula. Lastly, though our program was led by trained teachers, it is possible to consider how to scale this model with the help of digital tools (e.g., augmented reality storytelling, an interactive video tutorial, etc.), especially in areas where specialized physical education instructors are not always available. These innovations would make the program of high-quality motor development more democratic and maintain the main principles of narrative embodiment and joyful movement which form the basis of its success.

Practical Implications

The results of this research have great practical implications for early childhood educators, curriculum designers, and policymakers. Kinesthetic intervention, using drama-based activities, is a viable, cheap, and very effective approach of improving the basic motor skills without special equipment and having to expend a lot of training. Locomotor, object control, and balance activities built into imaginative stories, e.g., space missions or jungle adventures, will help teachers to turn ordinary physical activity into meaningful, joyful, and developmentally rewarding experiences that also enhance motor competence, intellectual interest, and social communication. This method is consistent with the international standards of active and play-based learning (WHO, 2020) and aids in designing inclusive classrooms with children of different abilities and enables them to contribute meaningfully. Embodied cognition and creative drama principles should hence be integrated in the teacher training programs to enable teachers to plan and teach such whole-body lessons and eventually promote holistic development and foundation school readiness in physical literacy.

Study Limitations

Although the current research presents strong support regarding the effectiveness of the drama-based kind of kinesthetic activities in improving the basic motor skills of kindergarten children, there are a few limitations that should be admitted. To begin with, the quasi-experimental design, where the classroom groups are used instead of the random individual assignment, creates the possibility of the introduction of selection bias, even though the baseline between the two groups is similar in terms of demographic and motor variables. Even though ANCOVA adjusted for pretest scores, there were uncontrolled confounding variables (i.e. previous extracurricular physical activity, parental interaction, or learning at home) that could have affected results. Second, the sample was selected based on one kindergarten in Kuwait, which did not allow the generalizations of the results on other cultural, socioeconomic, or educational backgrounds. External validity should be established by replication in different settings such as use of public versus private institutions, urban versus rural settlements, and national curriculum

in different countries. Third, a lack of long-term follow-up does not allow making conclusions regarding the motor gains maintenance beyond the timeframe of the immediate post-intervention. The delayed post-tests (e.g. 3-6 months after intervention) should be included in future research to test the sustainability of the skills in the future. Fourth, although the objectivity assessment was done to assess the motor performance in the form of uniform field tests, social and cognitive outcomes like executive functioning, emotional control, or social interaction were not measured. Considering the theoretical relationships between motor competence and other development areas, in future studies, the implementation of a multidimensional assessment package should be taken to examine the possibility of cross-domain transfer outcomes. Lastly, intervention fidelity was observed through video recording and independent observation (90% of adherence), but there was a possibility of variability in the narrative delivery, cues or feedback quality due to the use of educator-delivered implementation. Program scalability and optimal dosage would also be optimized with training standardization and dose-response training (e.g. 2 vs. 3 sessions/week). Nevertheless, the limitations are not the only strength of the study because there are some theory-based interventions, the validated motor measures, robust effect sizes, and ecological implementation in the kindergarten environment, which has a good basis to develop future research and practical implementation.

Conclusions

The drama-based kinesthetic involvement is a low cost but effective method of promoting the basic motor skill development in the kindergarten child. It is practicable as an interesting instructional method, as well as a methodical intervention, which reliably focuses on fundamental locomotor, object-handling, and balance abilities in a purposeful, narrative setting. The current research proves that an 8-week program of creative storytelling and intentional movement is consistently and significantly associated with better motor performance in all the measured spheres-sprint speed, jump distance, throw accuracy, catch proficiency, and static and dynamic balance-with large effect sizes (Cohen d= 0.92-3.65). This was not found in a control condition that involved regular exercise, which indicated that dramatic framework, and not increased activity per se is the active constituent. This suggests that placing motor practice in dramatized contexts (e.g., jumping over lava rivers, saving treasure) has an intensity that is developmentally appropriate and consistent with the principles of moderate-intensity domain in exercise physiology, but in the context of early childhood. It is a strategy that can effectively fill the gap between play and purposeful practice to enable children to amass quality repetitions without feeling that they are being forced to practice. Those findings indicate the presence of striking homogeneity of response with a uniform cohort of 4- to 6-year-olds as a group, and, in turn, indicates that this model can be potentially generalized to a wide variety of early childhood contexts (such as the ones which provide children with different motor baselines or limited access to special physical education). Kinesthetic learning through drama-based organization of motor learning may allow teachers to be at an optimal challenge level that allows skill acquisition without frustration or lack of engagement which is especially significant to inclusive or resource-limited settings. Further, the technique is in line with the recommendations on early childhood development in the world that notes the importance of active, playful, and holistic learning (World Health Organization (WHO), 2020). As endurance athletes are cautioned not to work harder than they can talk to keep their work within the aerobic range, so young children run when the story tells them to run, making physical exercise always accompanied by fantasy, emotional security, and self-motivation. Therefore, drama is not an addition to motor development; it is a structural frame that renders movement being significant, memorable and masterful.

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