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The Effect of Traditional Egrang Sports on Static and Dynamic Balance in Elementary School Students

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ABSTRACT

This study aims to analyze the effect of traditional egrang sports on static and dynamic balance in elementary school students. This study uses a quantitative, experimental approach with a one-group pretest-posttest design. The research sample consisted of 57 fifth and sixth-grade students at Elementary School 1 Seliling, selected through total sampling. The instruments used were the Stork Stand Test for static balance and the Beam Balance Test for dynamic balance. Egrang training was provided for 4 weeks, once per week. Data analysis was carried out using descriptive and inferential statistics, including paired-samples t-tests, after satisfying the prerequisite tests for normality and homogeneity. The results showed increases in average static balance from 18.25 to 27.77 and in dynamic balance from 2.82 to 3.84. The results of the hypothesis test showed a significance value of 0.000 ($p < 0.05$) for both variables, indicating a significant effect of egrang training on static and dynamic balance. Based on the distribution of categories, improvements in dynamic balance appear more pronounced than those in static balance, although statistically, static balance shows a greater improvement. This study concludes that egrang training is effective in improving static and dynamic balance in elementary school students. Therefore, the traditional egrang game can serve as an innovative, fun, and culturally rooted alternative for learning physical education, supporting children's motor development.

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INTRODUCTION

Motor development constitutes a fundamental dimension of children's growth and well-being during the elementary school years (Zakiyah et al., 2024). During this developmental phase, children experience substantial progression in both gross and fine motor skills. Gross motor skills-encompassing the coordinated use of large muscle groups in activities such as walking, running, jumping, and balance maintenance-provide the essential foundation for daily physical activity and children's engagement in diverse sporting pursuits (Almeida et al., 2021; Newell, 2020). Fine motor skills, by contrast, involve precise coordination of smaller muscle groups, particularly in the hands, fingers, and wrists (Bondi et al., 2022). Appropriate and timely stimulation of motor development is therefore essential to support children's optimal physical growth.

One of the most significant components within the motor skill domain is balance-defined as the capacity to maintain postural control both when stationary (static balance) and while in motion (dynamic balance) (Adi et al., 2022). Static balance refers to the ability to sustain a given body position without displacement, whereas dynamic balance involves maintaining stability throughout continuous movement sequences (Gonçalves et al., 2022). Both dimensions of balance are critical for supporting children's participation in physical activities, including play, structured learning, and sport.

Balance skills in elementary school-aged children are frequently still maturing, a pattern influenced by ongoing neurological development, evolving muscle strength, progressive improvements in coordination, and the accumulation of movement experience (Suryani, 2023). Insufficient movement stimulation during this period can produce deficient balance skills, with downstream consequences including physical activity limitations and elevated injury risk (Hasan & Anam, 2020; Juhanis et al., 2025). Targeted and contextually appropriate interventions are therefore warranted to develop balance capacities during the elementary school years.

Traditional games offer a compelling pedagogical vehicle for motor development interventions, given their inherent educational value across physical, social, cultural, and cognitive dimensions. Their engaging and enjoyable character additionally promotes children's intrinsic motivation for physical participation. Among traditional Indonesian games, egrang demonstrates particularly strong potential for developing motor skills, with balance as the primary target. The activity requires children to ambulate using elongated bamboo poles with small footrests, demanding optimal body coordination, lower limb strength, and continuous balance regulation (Ivarianti, 2023; Muti et al., 2025). This practice directly engages the vestibular and proprioceptive systems, which play pivotal roles in maintaining and modulating postural equilibrium. Egrang activities simultaneously train static balance-required when standing on the footrests-and dynamic balance-demanded during forward movement, turning, and postural adjustment in response to external perturbations (Suhariyanti et al., 2024). The activity additionally develops concentration, motor courage, and inter-segmental coordination, positioning egrang as an effective and culturally resonant exercise alternative for improving children's motor capacities.

Despite its recognised developmental benefits, the systematic use of traditional games such as egrang in formal physical education instruction remains limited in practice. Schools frequently rely on conventional training methods that lack variety and fail to sustain students' engagement, potentially contributing to low physical activity participation and suboptimal motor skill development-particularly in balance. Evidence demonstrates that active, whole-body coordination challenges can improve balance in children (Insyur, 2025; Maulida et al., 2024), yet scientific inquiry specifically examining the effects of egrang training on both static

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and dynamic balance in elementary school students remains sparse. The present study was therefore designed to address this gap by rigorously investigating whether a structured egrang training programme produces statistically significant improvements in both balance dimensions. The findings are intended to contribute evidence supporting the development of more innovative, effective, and culturally grounded physical education methods.

METHODS

A quantitative approach with a one-group pretest-posttest experimental design was employed to examine the effect of egrang training on static and dynamic balance.

Participants

All students enrolled at SDN 1 Seliling who were actively participating in regular Physical Education classes and who presented with broadly similar baseline characteristics were considered eligible for inclusion. Fifth- and sixth-grade students meeting all inclusion criteria during the data collection period were recruited, yielding a total sample of 57 participants.

Sampling Procedure

A total sampling approach was employed, whereby all students meeting the inclusion criteria were enrolled as participants. Coordination with school administration and classroom teachers facilitated identification of eligible fifth- and sixth-grade students who were actively enrolled and willing to participate. Participants were recruited through direct communication and explanation of the study's purpose, procedures, and participation requirements to both students and teachers. The resulting sample comprised 57 participants.

Research Instruments and Materials

Two standardised instruments assessed students' balance.

The *Stork Stand Test* measured static balance, requiring participants to stand on one foot for as long as possible, with performance quantified in seconds. The *Beam Balance Test assessed* dynamic balance by requiring participants to walk across a balance beam from start to finish while maintaining postural stability; performance was scored on a 0-5 scale reflecting movement stability and completion time. Supporting apparatus included a stopwatch and a balance beam.

Table 1. Stork Stand Test Assessment Criteria (in seconds)

	Excellent	Good	Average	Poor	Very Poor
Male	>50 s	41-50 s	31-40 s	20-30 s	<20 s
Female	>30 s	23-30 s	16-22 s	10-15 s	<10 s

Table 2. Beam Balance Test Assessment Criteria

5	Walks perfectly on the balance beam without checking balance or stopping; completes the walk in six seconds.
4	Walks on the beam with minor unsteadiness; completes the walk in six seconds.
3	Walks on the beam with unsteadiness; may stop one or more times; takes more than six seconds.
2	Walks on the beam with pronounced unsteadiness, near-falls, possible stops, and/or takes more than six seconds.
1	Falls off the beam before completing the walk.
0	Falls off the beam immediately upon stepping on.

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Data Collection Procedures

Data collection commenced with a pretest to establish students' baseline static and dynamic balance using both instruments. Following pretest administration, participants received four weeks of egrang training delivered at one session per week during regular Physical Education lessons, with each session lasting approximately 30-45 minutes and structured across warm-up, practice, and cool-down phases. Session 1 introduced egrang and focused on foundational balance and stepping techniques. Session 2 developed walking coordination and postural control during forward movement. Session 3 targeted movement control, directional changes, and dynamic stability. Session 4 refined balance through increasingly complex movement tasks integrated into simple game-based challenges. The progressive session design was informed by motor learning principles for elementary school-aged students, emphasising gradual task complexity, structured repetition, and progressive challenge to systematically develop postural stability and coordination. Upon completion of the training programme, both instruments were re-administered as a posttest.

Data Analysis

Descriptive statistics (mean, standard deviation, minimum, and maximum) summarised pretest and posttest scores for each balance variable. Prior to hypothesis testing, the Shapiro-Wilk normality test and Levene's homogeneity of variance test were conducted to verify that parametric assumptions were satisfied. Hypothesis testing was performed using paired-samples t-tests at a significance level of $\alpha = 0.05$ to determine whether statistically significant differences existed between pretest and posttest balance scores.

RESULTS

Sample Characteristics

Table 3. Characteristics of the Research Sample

Group	Characteristic	n	Description	Frequency (%)
Gender	Male	27		47.37
	Female	30		52.63
Body Mass Index	Underweight	20	BMI below normal range	35.09
	Normal	22	BMI within normal range	38.59
	Overweight	10	BMI above normal range	17.54
	Obese	5	BMI well above normal range	8.78

Of the 57 participants, 30 were female (52.63%) and 27 were male (47.37%), yielding an approximately balanced gender distribution. BMI analysis indicated that the largest single subgroup was classified as normal weight (22 students; 38.59%), followed by underweight (20 students; 35.09%), overweight (10 students; 17.54%), and obese (5 students; 8.78%). The predominance of normal-weight participants indicates broadly adequate nutritional status at the group level, though the substantial underweight proportion warrants acknowledgement in the interpretation of motor outcomes.

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Descriptive Statistics

Table 4. Descriptive Statistics for Pretest and Posttest Balance Scores

Variable	N	Min	Max	Mean ± SD	Gain
Stork Stand Test - Pretest	57	8	34	18.25 ± 7.18	-
Stork Stand Test - Posttest	57	12	51	27.77 ± 10.42	+9.52
Beam Balance Test - Pretest	57	1	4	2.82 ± 0.97	-
Beam Balance Test - Posttest	57	2	5	3.84 ± 0.82	+1.02

Static balance (Stork Stand Test) mean scores increased from 18.25 ± 7.18 at pretest to 27.77 ± 10.42 at posttest, representing a mean gain of 9.52 seconds. Dynamic balance (Beam Balance Test) mean scores increased from 2.82 ± 0.97 at pretest to 3.84 ± 0.82 at posttest, a mean gain of 1.02 points on the 0-5 scale.

Category Distribution

Table 5. Pretest and Posttest Category Distribution: Static and Dynamic Balance

Category	Stand Stork Pretest	Stand Stork Posttest	Beam Balance Pretest	Beam Balance Posttest	Change
Excellent	1	10	0	13	↑+13
Good	8	9	15	24	↑+9
Average	10	19	24	18	↓−6
Poor	20	11	11	2	↓−9
Very Poor	18	8	7	0	↓−7

Category-level analysis revealed meaningful distributional shifts in both variables. In static balance, the number of students in the excellent category increased from 1 to 10, and students in the poor and very poor categories declined from 38 combined to 19. In dynamic balance, the excellent category increased from 0 to 13 students, the good category from 15 to 24, and the very poor category was entirely eliminated (from 7 to 0 students). The distributional improvements in dynamic balance were more pronounced in the upper categories, while improvements in static balance were distributed more broadly across the spectrum.

Prerequisite Tests

Table 6. Normality and Homogeneity Test Results

Variable	Shapiro-Wilk Sig.	Homogeneity Sig.	Distribution
Static Balance (Stork Stand Test)	0.200	0.076	Normal / Homogeneous
Dynamic Balance (Beam Balance Test)	0.066	0.076	Normal / Homogeneous

Shapiro-Wilk test results confirmed normal data distributions for both variables (static balance: p = 0.200; dynamic balance: p = 0.066; both above the 0.05 threshold). Levene's test

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confirmed homogeneous variance (p = 0.076). Parametric testing assumptions were therefore satisfied, supporting the application of paired-samples t-tests.

Inferential Analysis

Table 7. Pretest and Posttest Category Distribution: Static and Dynamic Balance

Variable	Mean Diff.	Std. Deviation	Std. Error Mean	t	df	Sig.
Static Balance (Stork Stand)	−9.526	5.312	0.704	−13.539	56	0.000
Dynamic Balance (Beam Balance)	−1.018	0.790	0.105	−9.720	56	0.000

Paired-samples t-tests confirmed statistically significant improvements in both balance variables. Static balance recorded a mean difference of −9.526 (t(56) = -13.539; p = 0.000), and dynamic balance a mean difference of -1.018 (t(56) = -9.720; p = 0.000). Both significance values were well below the α = 0.05 threshold, confirming that egrang training produced significant improvements in both static and dynamic balance. The larger absolute t-value for static balance indicates a numerically greater mean improvement in that dimension, while category distribution analysis reveals that distributional shifts were more pronounced for dynamic balance.

DISCUSSION

Effectiveness of Egrang Training on Balance: A Physiological Explanation

The results of this study confirm that a structured four-week egrang training programme produced statistically significant improvements in both static and dynamic balance among elementary school students. These findings are consistent with motor development theory, which posits that balance capacities are enhanced through active, repetitive, and progressively challenging training that demands postural adaptation (Andrieieva et al., 2021; Yu et al., 2025). Egrang training fulfils each of these principles through its inherent demands for concentration, whole-body coordination, and continuous adaptation to controlled instability, thereby stimulating the neuromuscular systems responsible for postural control and movement regulation.

The improvement in static balance reflects the demands that egrang places on postural control and joint stability during stationary standing on elevated footrests. Sustaining an upright posture on the narrow bamboo steps requires active regulation of the ankle, knee, and hip joints against gravitational perturbation, progressively strengthening the neuromuscular circuitry governing quiet stance control (Sofiana & Hasanudin, 2026). This activity directly engages the vestibular and proprioceptive systems, both of which are critical mediators of static postural equilibrium. The dynamic balance improvements reflect the more complex sensorimotor demands of egrang locomotion-forward ambulation, directional turning, and positional adjustment while elevated-which require continuous integration of visual, vestibular, and proprioceptive afferent signals with motor output to maintain stability throughout movement.

Greater Distributional Improvement in Dynamic Balance

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The category distribution analysis revealed that distributional gains were more pronounced in dynamic balance than in static balance: the excellent category increased from 0 to 13 students for dynamic balance, while the very poor category was entirely eliminated. This pattern is attributable to the predominantly dynamic character of egrang training: students not only stand still but also walk, turn, and adapt their posture in response to varied environmental demands, providing a qualitatively richer and more ecologically valid stimulus for dynamic postural control than for static equilibrium. Consequently, adaptation in dynamic balance was more broadly distributed across the student cohort, producing larger shifts in the upper category bands. The t-test results nevertheless confirm that the absolute mean improvement was numerically larger for static balance (mean diff. = 9.526 s vs. 1.018 points), reflecting the greater absolute measurement range of the Stork Stand Test relative to the 0-5 Beam Balance scale.

Alignment with Game-Based Motor Learning Evidence

The findings of this study are consistent with a converging body of evidence demonstrating that game-based physical activities targeting balance improve children's motor skills (Darussalam et al., 2025; Fatitah, 2024). Aliriad et al. (2024) further established that culturally contextualised, enjoyable learning approaches such as traditional games can elevate student motivation and engagement, with positive downstream effects on motor learning outcomes. The present results accordingly support the view that egrang walking, as a physically active and perceptually complex form of traditional play, is effective in developing both balance dimensions in elementary school-aged children.

It should be acknowledged that some studies have reported less marked or more nuanced balance improvements through traditional game interventions relative to specialised structured training or modern balance equipment, suggesting that training duration, session frequency, and participant characteristics may moderate the magnitude of observed effects (Chen et al., 2021; Paillard, 2023). The four-week, once-per-week schedule employed in the present study was deliberately conservative to permit feasibility within school timetabling constraints; higher frequency or extended programmes may be expected to yield greater gains.

Practical Implications for Physical Education

The evidence presented in this study supports the integration of egrang activities as a regular component of elementary school physical education. Beyond its demonstrated efficacy for balance development, egrang engagement cultivates additional dimensions of value: it fosters concentration, motor courage, and inter-segmental coordination; sustains student motivation through its playful and inherently challenging format; and contributes to the preservation of Indonesian cultural heritage. Children who maintain adequate balance capacities tend to be more physically active, more self-confident, and better equipped to engage safely in diverse sporting and recreational activities, outcomes with long-term health and developmental significance. Physical education teachers are accordingly encouraged to incorporate progressively structured egrang sessions into lesson programmes, utilising graduated task complexity to maximise neuromuscular adaptation while maintaining student engagement.

Limitations and Directions for Future Research

Several methodological limitations should be considered when interpreting these findings. The absence of a control group precludes definitive causal attribution of observed improvements to the egrang intervention specifically, as maturation, practice effects, and

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non-specific treatment factors cannot be excluded as contributing influences. The relatively brief four-week intervention and once-per-week training frequency may have constrained the magnitude of achievable motor adaptation. The sample was drawn from a single elementary school, limiting the generalisability of results to broader populations with differing physical activity backgrounds, BMI profiles, or cultural contexts. Future research should address these limitations by employing randomised controlled or quasi-experimental designs with matched control groups, increasing training frequency and duration, recruiting diverse multi-school samples, and incorporating additional outcome measures such as proprioceptive sensitivity, lower limb strength, physical activity levels, and long-term retention of balance gains.

CONCLUSION

This study demonstrates that a four-week structured egrang training programme significantly improved both static and dynamic balance in elementary school students at SDN 1 Seliling ($p = 0.000$ for both variables). Static balance mean scores increased from 18.25 to 27.77 seconds, and dynamic balance mean scores rose from 2.82 to 3.84 on the Beam Balance scale. Category distribution analysis revealed more pronounced distributional improvements in dynamic balance, while inferential statistics indicated a numerically larger absolute gain in static balance. These complementary findings collectively affirm that egrang training constitutes an effective, engaging, and culturally meaningful intervention for improving motor balance in elementary school children. The traditional egrang game may therefore serve as an innovative and viable alternative approach for physical education, simultaneously advancing motor development objectives and sustaining engagement with Indonesian cultural heritaget.

AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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