



Traditional Javanese Dance Therapy: An Effective Means of Improving Muscle Strength and Body Balance in Elementary School Students

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Abstract

Introduction. Traditional Javanese dance can be used as a method to improve gross motor skills in elementary school students. Traditional Javanese dance has rhythmic, aesthetic and postural elements such as swinging hand movements, standing with one leg, shaking the head and walking slowly can stimulate core muscle strength, balance and body coordination in a stimulant.

Objective. This study aims to analyze the effectiveness of traditional Javanese dance therapy in improving muscle strength and body balance in elementary school students.

Methodology. This study used a quasi experimental design with a pretest posttest group. Involving 60 students consisting of 30 experimental class students and 30 control class students with characteristics of children aged 11–12 years, mixed gender, generally healthy. The experimental group was given traditional Javanese dance therapy treatment, while the control group was not given special treatment related to traditional Javanese dance therapy. Instruments include muscle strength tests (handgrip and leg dynamometer) as well as balance error scoring system and dynamic balance beam test. A Paired Sample T-Test was conducted to compare the results of the pretest and posttest in each group, the Independent Sample T-Test to compare the changes in results between experimental and control groups, and Cohen's d to measure how much the effect of dance therapy on the variables measured.

Result. The results of the analysis of the paired t-test and independent t-test showed a significant increase in hand and foot muscle strength ($p < 0.05$), as well as static and dynamic balance (< 0.05) in the experimental group compared to the control group.

Discussion. The results of the study showed that the provision of structured Javanese dance training for 2 weeks had a significant influence on increasing muscle strength and body balance of elementary school students. These findings show that cultural arts activities such as Javanese dance can be used as an effective and fun alternative to physical exercise in the context of physical education.

Conclusions. The conclusion of this study is that traditional Javanese dance is structured effectively to improve muscle strength and body balance of elementary school students, so that it can be used as an alternative to physical learning based on local culture.

Keywords

Body balance, elementary school, muscle strength, Javanese dance.

Resumen

Introducción. La danza tradicional javanesa se puede utilizar como método para mejorar las habilidades motoras gruesas en estudiantes de primaria. La danza tradicional javanesa tiene elementos rítmicos, estéticos y posturales, como los movimientos de las manos, pararse con una pierna, sacudir la cabeza y caminar lentamente pueden estimular la fuerza muscular central, el equilibrio y la coordinación corporal en un estimulante.

Objetivo. Este estudio tiene como objetivo analizar la efectividad de la terapia de danza tradicional javanesa en la mejora de la fuerza muscular y el equilibrio corporal en estudiantes de primaria.

Metodología. En este estudio se utilizó un diseño cuasi-experimental con un grupo pretest-posttest. Con la participación de 60 estudiantes, de los cuales 30 fueron experimentales y 30 control, con características de niños de 11 a 12 años, mixtos, generalmente sanos. El grupo experimental recibió tratamiento de danza tradicional javanesa, mientras que el grupo de control no recibió un tratamiento especial relacionado con la terapia de danza tradicional javanesa. Los instrumentos incluyen pruebas de fuerza muscular (empuñadura y dinamómetro de piernas), así como el sistema de puntuación de errores de equilibrio y la prueba de barra de equilibrio dinámica. Se realizó una prueba T de muestra pareada para comparar los resultados del pretest y posttest en cada grupo, la prueba T de muestra independiente para comparar los cambios en los resultados entre los grupos experimental y control, y la d de Cohen para medir cuánto afectaba la danza terapia en las variables medidas.

Resultado. Los resultados del análisis de la prueba t pareada y la prueba t independiente mostraron un aumento significativo en la fuerza muscular de manos y pies ($p < 0,05$), así como en el equilibrio estático y dinámico ($< 0,05$) en el grupo experimental en comparación con el grupo control.

Discusión. Los resultados del estudio mostraron que la provisión de entrenamiento estructurado de danza javanesa durante 2 semanas tuvo una influencia significativa en el

aumento de la fuerza muscular y el equilibrio corporal de los estudiantes de primaria. Estos hallazgos muestran que las actividades artísticas culturales, como la danza javanesa, pueden utilizarse como una alternativa eficaz

y divertida al ejercicio físico en el contexto de la educación física.

Conclusiones. La conclusión de este estudio es que la danza tradicional javanesa está estructurada de manera efectiva para mejorar la fuerza muscular y el equilibrio corporal de los estudiantes de primaria, por lo que puede ser utilizada como una alternativa al aprendizaje físico basado en la cultura local.

Palabras clave

Equilibrio corporal, escuela primaria, fuerza muscular, danza javanesa.

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Introduction

The physical development of elementary school students is very important in supporting motor skills, health, and daily learning activities. **Muscle strength and body balance are two key aspects of gross motor that must be developed early on and can be improved through goal-oriented play (Sutapa et al., 2021).** However, based on global data from the World Health Organization (WHO, 2020), About 80% of elementary school students do not meet the recommended physical activity of at least 60 minutes per day. This condition results in low development of muscle strength and body balance which has an impact on the quality of life and health of children.

In Indonesia, data from Basic Health Research, It shows that 35% of children aged 6-12 years experience suboptimal physical fitness, including weaknesses in balance and muscle strength. In addition, a survey by the Indonesian Ministry of Education and Culture in 2021 revealed that only about 40% of elementary school students routinely participate in structured physical activities such as sports and dance, which should be important media in gross motor development. This low participation is suspected to be due to the limitations of the curriculum and the lack of interest of children in physical learning methods that are less varied and interesting.

Traditional dance, especially Javanese dance, offers a potential solution as an effective motor development medium while maintaining cultural values (Moula et al., 2022). Traditional Javanese dance therapy has rhythmic, aesthetic and postural elements that can be used as an effective form of movement therapy. Movements such as swinging hands, standing on one leg, shaking head, and walking slowly in Javanese dance can train core muscle strength, body balance and body coordination simultaneously

Various international studies have confirmed the effectiveness of dance practice in improving children's motor skills (Maïano et al., 2020). Kim (2021) **Found that traditional dance exercises improved muscle grip strength, long jump results, and two-step test scores.** Anderson (2024) **reported that digital dance activities can improve the motor skills of primary school students in unexpected environments, as measured by the Motor Assessment Battery for Children checklist.** González (2025) **It also states that dance exercises and therapy are effective in improving gross motor skills, including body coordination and balance.** In addition, dance therapy also not only affects improving children's gross motor skills, but also plays an important role in student performance (Polanco-Zuleta et al., 2025) Choudhari (2025), **shows that dance therapy in elementary school children can reduce the rate of smartphone addiction and improve their gross motor skills,** while Fong Yan et al., (2020) **Emphasizing the role of dance practice in strengthening (core stability).** Wang et al., (2022) **reported that regular cultural dance interventions can improve muscle fitness and body stability in children aged 7-10 years.** Lokoviti (2025) **Highlighting dance as a contemporary dance therapy is effective in improving static and dynamic balance and children's motor coordination.** Waddington et al., (2021) **strengthening the influence of dance practice on improving balance in school-age children.** Lee et al., (2020) and Martinez, L., & Ross, (2020) **Associate dance practice with improved posture and overall gross motor development.**

However, most of the research focused on types of dance or dance practices that are general and global, as well as on child populations outside the Indonesian cultural context. Research that specifically examines the effectiveness of traditional Javanese dance, which has certain characteristics of movements and rhythms in improving muscle strength and balance in elementary school children in Indonesia, is still very limited. This is an important gap that needs to be filled considering the existence of Javanese dance as part of the national cultural heritage and its potential as an effective and fun physical learning medium.

Therefore, this study aims to empirically examine the effectiveness of Javanese dance in improving muscle strength and body balance in elementary school students, with the hope of making a significant contribution to the development of a holistic and culture-based physical education curriculum in Indonesia.

Method

Research Design

This study is a quantitative research with a quasi experimental design approach with a pretest-posttest control group design. This design was chosen to measure the effect of Javanese dance interventions directly on the variables of muscle strength and body balance of elementary school students. The

characteristics of the participants are children aged 11-12 years, mixed gender, generally healthy. Participants were allocated using purposive sampling without randomization. The outcome assessor is not blinded. No dropout participants were recorded during the 2-week intervention period.

Population and Sample

The population in this study is all 6th grade elementary school students in two public elementary schools in Tegal City, which amounts to around 100 students. The sampling technique used purposive sampling with the criteria that students were physically healthy, did not have motor disorders or diseases that inhibited physical activity, and obtained permission from parents. The sample was taken as many as 60 students, then divided into two groups, the first group was an experimental group (n=30), namely students who participated in a Javanese dance training program for 2 weeks. The second group was the control group (n=30), namely students who did not participate in the intervention and continued to undergo learning activities as usual without dance practice. The division of groups is carried out by class and takes into account the balance of initial characteristics such as age and gender so that the groups are comparable.

Measurement Instruments

Measurement of muscle strength and body balance is carried out with the following tools and procedures:

- Muscle Strength:
 - *Hand dynamometer*: to measure grip strength, which reflects the strength of the upper limb muscles.



Figure 1. Hand muscle strength test

- *Squat Jump Test*: measures the strength of the lower extremity muscles through the student's jump height measured using a digital jump measuring device.



Figure 2. Leg muscle strength test

- Body Balance:
 - *Stork Balance Test*: students stand with one foot on a flat surface for as long as possible, measuring static balance.



Figure 3. Static balance test

- *Balance Error Scoring System (BESS)*: measures dynamic balance with multiple standing positions tested on flat and uneven surfaces, with postural error logging.



Figure 4. Dynamic Balance Test

All instruments have had reliability and validity tested in the primary school-age population (references from standard literature).

Research Procedure

The research was carried out for 2 weeks with the following details:

1. Pretest:

Before the intervention, all students from both groups were subjected to a pretest of muscle strength and balance using the above instruments.

2. Intervention:

The experimental group participated in a Javanese dance training program with a duration of 45 minutes per session, as many as 2 times per week. The program includes:

- Light warm-up (10 minutes) to prepare muscles and joints.
- Traditional Javanese dance movement exercises (30 minutes) that emphasize posture control, repetition of movements involving the core, legs, and hand muscles, and rhythmic coordination.



Figure 5. Javanese Traditional Dance Practice

- Cooling down (5 minutes) to reduce muscle tension.

The session was held in the school hall under the supervision of sport teachers who have been trained in Javanese dance and motor evaluation techniques.

1. Control Group:

The control group did not receive any intervention other than routine learning activities without additional dance exercises.

2. Posttest:

After 2 weeks, all students in both groups were again measured using the same instrument to obtain posttest data.

Data Analysis

Pretest and posttest results data were analyzed using the latest version of SPSS statistical software with the Normality Test procedure using Kolmogorov-Smirnov to ensure the data distribution met parametric assumptions, Homogeneity Test using Levene's Test to ensure variance between uniform groups, Paired Sample t-test to determine significant changes in muscle strength and balance in the experimental and control groups individually from pretest to posttest. And the Independent Sample t-test to compare the difference in improvement between the experimental and control groups. The significance level is set at $\alpha = 0.05$. In addition, the effect size is also calculated to assess the magnitude of the effect of the intervention.

Validity and Reliability

To maintain internal validity, the implementation of interventions is strictly supervised, and measurement instruments are carried out by trained evaluators. External validity was considered through the selection of a representative sample of the primary school population in the study area.

Results

Normality Test and Homogeneity Test

Before performing the t-test, the data were tested for normality using the Kolmogorov-Smirnov and homogeneity using the Levene's Test.

Table 1. Normality Test (Kolmogorov-Smirnov)

Variable	Group	Pretest (Sig.)	Posttest (Sig.)
Hand Muscle	Experiment	0.200	0.178
Strength	Control	0.183	0.172
Leg Muscle Strength	Experiment	0.174	0.165
	Control	0.185	0.196
Static Balance	Experiment	0.122	0.200
	Control	0.151	0.187
Dynamic Balance	Experiment	0.200	0.189
	Control	0.193	0.174

*All Sig. values > 0.05 indicate normally distributed data.

Table 2. Uji Homogenitas (Levene's Test)

Variabel	F	Sig.
Hand Muscle Strength	0.132	0.718
Leg Muscle Strength	0.219	0.641
Static Balance	0.336	0.564
Dynamic Balance	0.271	0.605

* All Sig. values > 0.05 indicate variance between homogeneous groups.

Paired Sample t-test

Table 3. Paired Sample t-test results

Variabel	Kelompok	t	df	Sig. (2-tailed)
Hand Muscle	Experiment	-9.435	29	0.001
Strength	Control	-1.564	29	0.128
Leg Muscle	Experiment	-10.728	29	0.001
Strength	Control	-1.248	29	0.222
Static Balance	Experiment	-12.518	29	0.001
	Control	-1.107	29	0.276
Dynamic Balance	Experiment	11.302	29	0.001
	Control	1.012	29	0.320

*Significant at $p < 0.05$, showed significant improvement after intervention on all variables.

*Not significant ($p > 0.05$), indicating no significant improvement without intervention.

Independent Sample t-test (Between Groups)

Table 4. Independent Sample t-test results (Experimental vs Control Posttest)

Variabel	t	df	Sig. (2-tailed)
Hand Muscle	7.008	58	0.001
Strength			
Leg Muscle Strength	7.233	58	0.001
Static Balance	9.234	58	0.001
Dynamic Balance	-6.921	58	0.001

*Significant ($p < 0.001$) showed a marked difference between the experimental and control groups after the intervention.

Effect Size (Cohen's d)

The effects of the intervention were calculated using *Cohen's formula d* based on the difference in mean and combined SD:

Table 5. Effect Size

Variabel	Cohen's d	Interpretasi
Hand Muscle Strength	1.79	Huge effect
Leg Muscle Strength	1.92	Very Huge Effect
Static Balance	2.10	Very Huge Effect

Dynamic Balance

1.86

Very Huge Effect

Test Details of Each Variable TestHand Muscle Strength (*Handgrip Strength Test*)**Table 6. Hand Muscle Strength Test Results**

Kelompok	Pretest (kg)	Posttest (kg)	Δ (Selisih)	% Peningkatan
Experiment	18.2	23.5	+5.3	29.12%
Control	18.0	18.9	+0.9	5.00%

Leg Muscle Strength (*Vertical Jump Test*)**Table 7. Leg Muscle Strength Test Results**

Kelompok	Pretest (kg)	Posttest (kg)	Δ (Selisih)	% Peningkatan
Experiment	28.7	36.2	+7.5	26.13%
Control	29.1	30.0	+0.9	3.09%

Static Balance (*Stork Stand Test*)**Table 8. Static Balance Test Results**

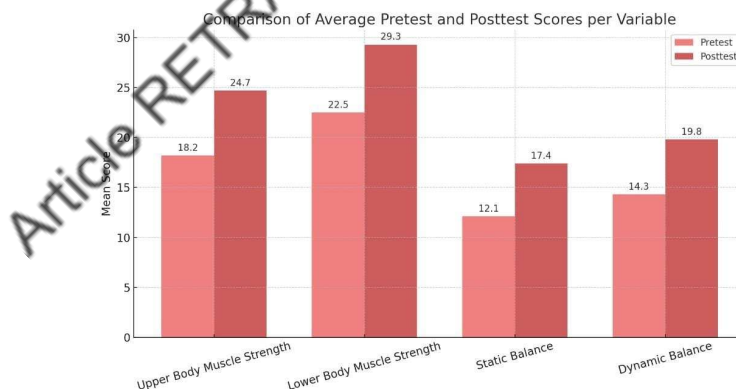
Kelompok	Pretest (kg)	Posttest (kg)	Δ (Selisih)	% Peningkatan
Eksperimen	16.5	26.4	+9.9	60.00%
Kontrol	16.2	17.0	+0.8	4.94%

Dynamic Balance (*Balance Error Scoring System (BESS) – Child version*)**Table 9. Dynamic Balance Test Results**

Group	Pretest (kg)	Posttest (kg)	Δ (Difference)	% Increased
Experiment	12.3	8.1	-4.2	34.15%
Control	12.1	11.6	+0.5	4.13%

*Note: A decrease in score indicates an increase in dynamic balance ability.

Here is a visual graph showing the comparison of the pretest and posttest average scores for each variable:



The results of the graph are:

- Hand Muscle Strength increased from 18.2 to 24.7
- Leg Muscle Strength increased from 22.5 to 29.3
- Static Balance increased from 12.1 to 17.4
- Dynamic Balance increased from 14.3 to 19.8

The graph makes it clear that Javanese dance interventions have a significant positive impact on the four aspects of physical fitness of elementary school students.

Discussion

The results of the paired t-test of hand muscle strength in the experimental group showed a significant increase ($p < 0.05$) between the average of pretest (18.2) and posttest (24.7). This shows that Javanese dance movements that involve open hand positions, lifting, and maintaining posture for a certain duration are able to train arm

and wrist muscle strength gradually. Movements such as ulap-ulap, ngithing, and seblak that maintain the position of the hand for a certain amount of time provide an isometric exercise effect that supports muscle strengthening. These findings are supported by research Tanner et al., (2020) which states that movement arts exercises such as dance have a positive effect on strengthening the upper muscles through rhythmic and controlled movement repetitions.

The average leg muscle strength of the pretest (22.5) and posttest (29.3) scores in the experimental group also showed a significant improvement ($p < 0.05$). Javanese dance requires the strength of the leg muscles in various positions such as squatting, jumping, and transitions between high and low levels, which put a load on the thigh, calf, and pelvic muscles. These results are in line with the findings Chen et al., (2020) which found that traditional dance programs were able to improve the leg muscle strength of elementary school children within 2–3 weeks. Dance movements that are repeated for a certain duration have a similar effect to light resistance exercises.

The increase in static balance scores from pretest (12.1) to posttest (17.4) showed an improvement in students' ability to maintain static balance. Static balance refers to the ability of the body to maintain a fixed position without wobbling while standing or in a single position. Javanese dance requires posture stability in gentle and slow movements, for example in a standing or ngeseh position, which requires control of the core muscles. Research by Beck et al., (2020) stated that dance exercises performed regularly can improve postural stability and strengthen the child's neuromuscular system.

The results of the posttest dynamic balance test (19.8) were higher than that of the pretest (14.3), with the results of the t-test showing significance ($p < 0.05$). Dynamic balance is the ability to maintain balance when changing positions or moving. In Javanese dance, transitions between movements from walking, stepping, bending, to spinning train students to control their balance while moving. Research by Harrington et al., (2021) It shows that dance activities that integrate foot coordination, weight shift, and spatial orientation have a direct effect on children's dynamic balance.



Figure 8. The First Week of the Dance Season



Figure 9. Javanese Dance Rehearsal for the Second Week

The results showed that the provision of Javanese dance training in a structured manner for 2 weeks had a significant influence on improving muscle strength and body balance of elementary school students. These findings show that cultural arts activities such as Javanese dance can be used as an effective and fun alternative to physical exercise in the context of physical education.

A significant increase in the strength of the muscles of the hands and feet can be explained through Javanese dance movements that demand the position of the hands in an open state, lifting, and maintaining posture for a certain duration. In addition, foot movements in a step pattern, bending the knees, and maintaining posture provide a natural resistance effect on the muscles of the lower body. This is in line with research by Schwender et al., (2020) which states that traditional dance activities can increase muscle strength because the movements resemble weight training with moderate intensity.

Similar results were also seen in the improvement of static and dynamic balance. Javanese dance, which emphasizes elegance of movement, posture stability, and smooth transitions between positions, contributes to the development of children's proprioceptive systems. Research by Kiefer et al., (2020) and Guss-West, C., & Wulf, (2020) It shows that dance-based programs are able to improve vestibular function and postural control in children.

In the cultural context, the approach through Javanese dance also supports a contextual and fun learning approach for students. As stated by Chatterjee et al., (2020), Emotional involvement and cultural values in arts-based learning can increase motivation and sustainability of physical activity in school-age children.

From the results of statistical tests using paired t-test and independent t-test, it can be seen that all variables have a significance value of $p < 0.05$. This suggests that interventions have a real impact, not just the result of natural fluctuations in children's motor development. This is reinforced by research Boone, E. M., & Leadbeater, (2020) who found that involvement in a dance program for at least 3 weeks was able to produce significant improvements in fine and gross motor aspects.

Thus, this study expands on previous findings that traditional art-based exercise programs can be used as an alternative to physical education strategies, particularly in elementary schools. Moreover, this approach supports the preservation of local culture that is in line with strengthening students' character and the goals of the independent curriculum.

Theoretically, this study strengthens the theory of motor learning and neurodevelopment put forward by Koch et al., (2020) that repetitive motor activity in a cultural context (such as traditional dance) supports the development of the sensorimotor system of elementary children. Practically, these findings have positive implications for sports teachers, cultural arts teachers, and schools to start integrating regional dances, especially Javanese dances, into local culture-based physical learning programs that are fun and have a positive physical impact. However, this study has limitations in terms of sample size and limited control over respondents' physical activity outside of the intervention session. Advanced research can expand age coverage and add components of psychological measurement such as students' interest or motivation in participating in culturally based physical activities.

Conclusions

This study shows that Javanese dance has significant effectiveness in improving muscle strength and body balance in elementary school students. The 2-week intervention through structured Javanese dance practice had a real impact on improving the strength of the hand and leg muscles, as well as the students' static and dynamic balance skills. This is due to the characteristics of Javanese dance which is rich in controlled movements, flexibility, and strengthening posture that demands stability and motor strength. From a theoretical perspective, these findings support a cultural- and motor-based learning approach in primary education. Meanwhile, practically, the results of the research encourage the integration of dance arts as part of the learning strategy of physical education and cultural arts in elementary schools. Javanese dance is proven not only to play a role in cultural preservation, but also as a medium to improve children's overall physical fitness. **This research related to Javanese dance therapy is expected to be a foundation for other researchers to be able to research further related to the effects of Javanese dance therapy on the gross motor development of elementary school students and other influences that may be found later.**

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