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The Effectiveness of Brain GYM on Improving Ability Motoric Smooth in Children Age Preschool in Kindergarten

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Abstract.*Background Back : Development motor fine is one of the aspect important in grow flower child age preschool that plays a role in support readiness learning and activities everyday . However , it is not all child experience optimal development so required proper stimulation . One of the methods that can used is exercise brain (brain gym), namely a series movement simple with purpose optimize function brain . Purpose Research : Research This aim For know effectiveness of Brain Gym on development motor smooth on children ages 3–5 years in the work area Subdistrict Batam City. Research methods This use pre- experimental design with one-group pretest-posttest approach . Sample A total of 31 children were taken use total sampling technique . Measurement development motor fine done using KPSP before and after intervention . Data analysis was carried out with paired sample t-test. Results: Research results show existence improvement development motor fine after given brain gym intervention . Before intervention , partly big child is in the category development doubtful (64.5%), whereas after intervention all over children (100%) are in the category in accordance development . Statistical test results show p -value = 0.000 (<0.05), which means there is influence significant effect of brain gym on development motor fine child . Conclusion: research This show that Brain Gym is effective in increase development motor fine child age preschool . Therefore that , Brain Gym can recommended as method stimulation development children in the neighborhood education and public.*

Keywords **:** *Brain Gym; Fine Motor Skills; Motoric Smooth; Preschool Children; Preschooler*

1. INTRODUCTION

Early childhood, particularly the preschool period (3–5 years), is a crucial phase in a child's growth and development, often referred to as the golden age. During this stage, development in various aspects, such as physical, cognitive, language, socio-emotional, and motor skills, occurs rapidly. This period lays the foundation for the development of children's abilities later in life, requiring optimal and targeted stimulation (Khasanah et al., 2022). One crucial aspect of this stage is fine motor development, which involves the coordination of small muscles, especially in the hands and fingers, in activities such as writing, drawing, and manipulating small objects (Damayanti et al., 2020; Bakara et al., 2025).

Optimal fine motor development plays a crucial role in supporting a child's readiness to learn. Children with strong fine motor skills tend to have better early academic abilities, particularly in writing and drawing. Conversely, delays in fine motor development can lead to difficulties in learning activities, decreased interest in learning, and low self-confidence (Nurjani & Aliyah, 2019). Furthermore, fine motor skills are closely related to a child's ability to control emotions and adapt to their environment (Lutfiana et al., 2020).

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Preschool-aged children are still found to experience delays in fine motor development. This is influenced by various factors, such as lack of stimulation, an unsupportive environment, and a lack of activities involving fine motor coordination (Rahmadayanti et al., 2023). Lack of stimulation in early life can hinder a child's optimal development, so appropriate and effective interventions are needed to address this issue (Widanti et al., 2021).

One form of intervention that can be implemented to stimulate fine motor development is brain gym. Brain gym is a series of simple movements aimed at stimulating the brain as a whole, both the right and left hemispheres, thereby improving children's body coordination, concentration, and learning abilities (Khasanah et al., 2022). The movements in brain gym involve cross-functional activity, concentration, and focus, which serve to integrate the nervous system with motor activity (Suwanti & Apriyani , 2023).

Several studies have shown that brain gym has a positive impact on child development. Research conducted by Rahmadayanti et al. (2023) showed that brain gym can improve fine motor skills by enhancing hand-eye coordination. Furthermore, other research indicates that brain gym is effective in improving concentration, memory, and learning readiness in early childhood (Widanti et al., 2021). This intervention is also considered practical because it is easy to implement, requires no special equipment, and can be packaged as a fun play activity for children (Khasanah et al., 2022; Edebiri et al., 2025).

Based on initial observations in the Batam Kota District work area, some children aged 3–5 years still exhibit suboptimal fine motor development. This is evident in the children experiencing difficulty performing simple activities such as drawing, arranging objects, and using writing instruments correctly. This condition indicates the need for appropriate stimulation to enhance children's fine motor development.

Based on this description, researchers are interested in conducting research on the effectiveness of brain gym on the fine motor development of preschool children (3–5 years old) in the Batam Kota District work area. This research is expected to contribute to the development of effective interventions to improve the growth and development of early childhood (Blegur et al., 2024).

2. RESEARCH METHOD

This study employed a quantitative design with a pre-experimental approach, namely a one-group pretest-posttest design. This design was used to determine changes in fine motor development in children before and after brain gym intervention. Measurements were conducted twice: before the intervention (pretest) and after the intervention (posttest),

without a control group. The study was conducted in the Batam Kota District, Batam City, involving preschool-aged children in several early childhood education units (PAUD/TK). The study was conducted in 2025. The population in this study was all children aged 3–5 years within the Batam Kota District. The study sample consisted of 31 respondents, determined using a total sampling technique, where all members of the population who met the inclusion criteria were included in the study sample.

Inclusion criteria for this study included: children aged 3–5 years, registered as students at PAUD/TK in the study area, in good health, and having obtained consent from their parents/guardians to participate in the study. Exclusion criteria included children who did not participate in the entire intervention series or experienced health problems during the study.

The independent variable in this study was brain gym, while the dependent variable was children's fine motor development. Fine motor development was measured using the Pre-Screening Development Questionnaire (KPSP), a widely used instrument for assessing children's development according to age.

The brain gym intervention consists of a series of simple movements aimed at stimulating brain-body coordination. The activities were structured, lasting approximately 15–20 minutes per session, and were conducted regularly over a specific period according to the research protocol. The research procedure began with a pretest to determine the children's fine motor development before the intervention. Next, respondents received the brain gym intervention according to a predetermined schedule. After completing the entire intervention series, a posttest was conducted to determine changes in the children's fine motor development.

Data analysis was performed using statistical software. Univariate analysis was used to describe the distribution of respondent characteristics and fine motor development. Bivariate analysis was conducted to determine the effect of the intervention using a paired sample t-test with a 95% significance level ($\alpha = 0.05$). Prior to statistical testing, the data were tested for normality to ensure normal distribution. This study adheres to ethical research principles, including obtaining informed consent from respondents through parents/guardians, maintaining confidentiality of respondents' identities, and ensuring that the intervention does not pose a risk to children.

3. RESULT AND DISCUSSION

Results

Fine Motor Development Before Intervention

Table 1. Distribution of Fine Motor Development Before Intervention (Pretest)

Development Category	Frequency (n)	Percentage (%)
Appropriate	11	35.5
Doubtful	20	64.5
Deviated	0	0
Total	**31**	**100**

Based on Table 1, the majority of respondents before the intervention were categorized as having doubtful fine motor development, accounting for 20 children (64.5%). Meanwhile, 11 children (35.5%) were classified as having development appropriate for their age.

Fine Motor Development After Intervention

Table 2. Distribution of Fine Motor Development After Intervention (Posttest)

Development Category	Frequency (n)	Percentage (%)
Appropriate	31	100
Doubtful	0	0
Deviated	0	0
Total	**31**	**100**

Based on Table 2, after the implementation of the brain gym intervention, all respondents (100%) were categorized as having appropriate fine motor development according to their age. No respondents remained in the doubtful or deviated categories.

The Effect of Brain Gym on Fine Motor Development

Table 3. Differences in Mean Scores of Fine Motor Development Before and After Intervention

Variable	N	Mean	Elementary School	p-value
Before intervention (Pretest)	31	8.35	1,279	
After intervention (Posttest)	31	9.68	0.475	0.000

Based on Table 3, the mean score of fine motor development before the intervention was 8.35, which increased to 9.68 after the intervention. The statistical analysis using a paired sample t-test showed a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference between pretest and posttest scores.

Discussion

Baseline Condition of Fine Motor Development

The pre-intervention findings revealed that the majority of children were classified in the “doubtful” category of fine motor development. This indicates that prior to intervention, many children have not yet reached optimal developmental milestones expected for their age. This condition reflects not only individual developmental variability but also potential gaps in environmental stimulation and early childhood engagement.

From a developmental perspective, fine motor skills are highly dependent on repeated sensorimotor experiences and environmental enrichment. As highlighted in recent literature, insufficient exposure to structured play activities—such as drawing, threading, or object manipulation—can significantly hinder neuromuscular coordination (Suryani et al., 2020). This suggests that the observed baseline condition may not solely be a biological issue, but rather a reflection of limited stimulation in the child's immediate environment.

Moreover, the increasing dominance of passive activities, particularly screen-based engagement, may further exacerbate this issue. Studies have shown that excessive screen time reduces opportunities for active motor practice, thereby delaying fine motor acquisition (Putri & Wahyuni , 2021). In urban settings such as Batam City District, where digital exposure is relatively high, this factor becomes particularly relevant.

However, it is important to note that the “doubtful” classification does not necessarily indicate permanent delay, but rather a transitional developmental phase that can be improved with appropriate intervention. Therefore, the baseline findings provide a strong rationale for implementing targeted stimulation programs such as Brain Gym.

Post-Intervention Improvement: Effectiveness or Short-Term Adaptation

Following the brain gym intervention, all participants shifted into the "appropriate" developmental category. While this result appears highly promising, a critical interpretation is necessary to avoid overgeneralization.

The observed improvement may indeed reflect the effectiveness of brain gym in enhancing fine motor coordination through structured and repetitive movements. Brain gym exercises are designed to stimulate bilateral brain integration, which supports coordination, attention, and motor planning (Dennison, 2019). This mechanism aligns with the observed increase in posttest scores.

However, an alternative interpretation must also be considered. The improvement may partially reflect a short-term adaptation effect rather than a sustained developmental change. Since the study employed a one-group pretest-posttest design without a control group, it is difficult to completely rule out external influences such as maturation, learning effects from repeated testing, or increased familiarity with assessment tasks.

This limitation is consistent with findings from Rahmawati et al. (2022), who noted that although brain gym significantly improved motor outcomes, the absence of long-term follow-up made it difficult to determine the durability of the intervention effect. Similarly, Wulandari and Sari (2023) emphasized that repeated exposure to similar motor tasks can lead to performance improvement independent of the intervention itself.

Therefore, while the post-intervention results strongly suggest effectiveness, caution must be exercised in attributing the entire improvement solely to brain gym without considering potential confounding factors.

Statistical Significance vs Practical Significance

The statistical analysis demonstrated a significant difference between pretest and posttest scores ($p < 0.05$), confirming that the intervention had a measurable effect. However, beyond statistical significance, it is essential to evaluate the practical or clinical relevance of this improvement.

The increase in mean score from 8.35 to 9.68 suggests a meaningful enhancement in fine motor ability. More importantly, the complete shift of all participants into the "appropriate" category indicates a substantial developmental impact. This suggests that brain gym is not only statistically effective but also practically beneficial in improving children's functional abilities.

From a neurodevelopmental standpoint, this effect can be explained by the principle of neuroplasticity, where repeated motor activity strengthens neural pathways involved in coordination and control (Jensen, 2020). Additionally, brain gym promotes sensory integration, enabling children to better process and respond to environmental stimuli (Utami et al., 2021). Nevertheless, it is important to critically acknowledge that the relatively small sample size (n = 31) may limit the generalizability of these findings. Future studies with larger and more diverse populations are needed to validate these results.

Implications and Limitations

The findings of this study have important implications for early childhood education and primary healthcare practice. Brain Gym can be considered a low-cost, accessible, and easily implementable intervention that can be integrated into daily learning activities or health promotion programs.

However, several limitations must be acknowledged. First, the absence of a control group limits the ability to establish causal inference. Second, the short duration of the study does not allow for evaluation of long-term effects. Third, potential bias from repeated measurements and observer subjectivity cannot be entirely excluded. Given these limitations, future research should adopt more rigorous designs, such as randomized controlled trials, and include longitudinal follow-up to assess the sustainability of the intervention.

4. CONCLUSION

This study demonstrates that brain gym intervention has a statistically significant effect on improving fine motor development among preschool children in the working area of Batam Kota District. The findings show a clear increase in mean scores and a categorical shift from predominantly “doubtful” to entirely “appropriate” developmental status after the intervention.

From a practical perspective, these results indicate that structured movement-based stimulation can effectively enhance children's motor coordination and functional abilities. The improvements observed in this study support the theoretical framework of neuroplasticity, suggesting that repeated and targeted motor activities can strengthen neural pathways involved in fine motor control.

However, despite these promising findings, the results should be interpreted with caution. The use of a one-group pretest-posttest design limits the ability to establish strong causal relationships. Additionally, the absence of long-term follow-up raises questions

regarding the sustainability of the observed improvements. Therefore, while brain gym appears to be an effective short-term intervention, further research is needed to confirm its long-term impact and broader applicability.

RECOMMENDATIONS

For Healthcare Providers and Educators

Brain gym exercises are recommended as a complementary intervention in early childhood education and primary healthcare settings. Midwives, healthcare workers, and teachers can incorporate these activities into routine programs to support optimal child development, particularly in improving fine motor skills.

For Parents

Parents are encouraged to actively engage their children in regular motor stimulation activities at home, including simple brain gym movements. Consistent parental involvement plays a crucial role in maximizing developmental outcomes during early childhood.

For Health Institutions and Policy Makers

Primary healthcare centers (Puskesmas) should consider integrating brain gym into child growth and development monitoring programs. Developing structured guidelines and training modules for healthcare providers may enhance the effectiveness and consistency of implementation.

For Future Research

Further studies are recommended to use more rigorous research designs, such as randomized controlled trials, to strengthen causal inference. Future research should also involve larger sample sizes and include long-term follow-up to evaluate the sustainability of intervention effects. Additionally, exploring combinations of brain gym with other developmental interventions may provide more comprehensive outcomes.

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