Indonesian Journal of Early Childhood Education Studies (IJECES)
Volume 14, Number 2, November 2025, Pages 116-123
e-ISSN: 2476-9584 (Online), p-ISSN: 2252-8415 (Print)

The Influence of Picture Coloring Activities on the Fine Motor Skills of Children Aged 5-6 Years

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DOI: https://doi.org/10.15294/ijeces.v14i2.2346
Submitted: 11/03/2024 **Revised:** 27/09/2025 **Accepted:** 25/11/2025

ABSTRACT
This study was conducted to address the limited development of fine motor skills among children in Group B2 at Bungamputi Kindergarten, Palu. The objective of this research was to examine the effect of picture-coloring activities on children's fine motor skills. A quantitative quasi-experimental design with a one-group pretest–posttest approach was employed. Data were collected through structured observations, teacher interviews, and documentation. The intervention consisted of six coloring sessions using structured images, including fish, sunflowers, beetles, seaside scenery, and rice fields. The results indicated a significant improvement in children's fine motor skills after the intervention. Children demonstrated better pencil grip control, reduced hand stiffness, improved coloring speed, and greater accuracy in coloring within patterns. Statistical analysis revealed that the t-value ($t = 10.203$) exceeded the t-table value (2.14479) at $df = 14$ with a significance level of $\alpha = 0.000$ (< 0.05), indicating a statistically significant effect. Therefore, the alternative hypothesis (Ha) was accepted, confirming that picture-coloring activities positively influence children's fine motor skills. It is recommended that future studies explore integrating structured and free drawing activities to further support fine motor development in early childhood education.

Keywords: Coloring Activities; Early Childhood Education; Fine Motor Skills; Picture Coloring.

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1. INTRODUCTION

Early childhood (0–6 years) is widely recognized as a golden age of development, a critical and sensitive period in which rapid growth occurs across physical, cognitive, language, and socio-emotional domains. During this stage, appropriate educational stimulation plays a crucial role in optimizing children's developmental potential. Early childhood education (ECE) aims to lay the foundation for holistic growth by providing structured learning experiences aligned with children's developmental characteristics (Yeni Lestari et al., 2022). In Indonesia, ECE implementation is regulated under Law No. 20 of 2003 concerning the National Education System, which classifies early childhood education into formal (Kindergarten/TK and Raudhatul Athfal/RA), non-formal (Playgroups and Childcare Centers), and informal (family-based education) pathways. Kindergarten, as a formal institution serving children aged 4–6 years, plays a strategic role in facilitating learning through play-based approaches that ensure meaningful and developmentally appropriate experiences.

One essential domain of early childhood development is motor development, which includes gross and fine motor skills. Fine motor skills involve small muscle movements requiring precise coordination between the eyes and hands. These skills are fundamental for school readiness, particularly in pre-writing, drawing, cutting, and object manipulation activities. Research indicates that fine motor competence in early childhood significantly predicts later academic achievement, especially in literacy and numeracy domains (Khoury-Metanis & Khateb, 2024). Furthermore, fine motor proficiency has been linked to executive functioning, attention regulation, and self-control abilities (Karimi et al., 2025). Thus, strengthening fine motor skills during the kindergarten years is critical for supporting long-term educational success.

Beyond academic readiness, fine motor development contributes to children's independence in daily life activities, such as buttoning clothes, tying shoelaces, organizing learning materials, and completing classroom tasks independently. Insufficient stimulation of fine motor skills during preschool years may lead to handwriting difficulties and reduced classroom engagement in primary education (Purwanti et al., 2024). Therefore, structured and intentional motor stimulation activities are necessary within kindergarten learning environments.

From a neurodevelopmental perspective, repetitive manual activities such as coloring help strengthen neural pathways associated with visual-motor integration and motor planning. Studies in developmental neuroscience suggest that structured hand movements enhance cortical connectivity responsible for motor precision and coordination (Saarinen et al., 2020). When children color within specific patterns, they practice boundary control, spatial awareness, pressure regulation, and sustained attention. These components are foundational for later writing fluency and academic performance.

Various classroom activities can stimulate fine motor development, including cutting, collage, finger painting, weaving, and coloring. Among these, coloring activities are particularly popular with children because they combine creativity and skill training. Structured coloring tasks train pencil grip stability, finger flexibility, hand endurance, and visual-motor coordination. Recent findings show that visual-motor activities significantly improve dexterity and fine motor integration in early childhood learners (Mu'ammar et al., 2023). In addition, drawing and coloring activities enhance symbolic thinking and early representational abilities (Ningrum et al., 2025).

In line with Developmentally Appropriate Practice (DAP) principles, learning activities in kindergarten should be child-centered, engaging, and aligned with developmental stages (Nolde, 2023). Coloring activities meet these principles because they integrate play, imagination, and motor skill refinement. However, their effectiveness depends on instructional design. Without structured guidance, progressive difficulty, and systematic repetition, coloring activities may become routine tasks without producing significant developmental improvements.

Preliminary observations conducted in Group B2 at Bungamputi Kindergarten, Palu, revealed several challenges related to fine motor development. Approximately 73.33% of children experienced difficulty holding colored pencils correctly and showed stiffness in finger movements;

66.67% demonstrated limited neatness when coloring within patterns; and 80% required extended time to complete tasks. These findings suggest that current instructional strategies may not yet optimally stimulate fine motor coordination. Although coloring activities are commonly implemented in kindergarten classrooms, empirical evidence examining their measurable impact using experimental approaches in local Indonesian contexts remains limited. Previous studies indicate that coloring activities can significantly stimulate fine motor development by improving finger control, hand–eye coordination, and precision in manipulating writing tools (Jayusman et al., 2025).

In many early childhood classrooms, emphasis is often placed on the final product (e.g., neat worksheets) rather than the developmental process of motor coordination. This orientation may limit opportunities for gradual skill development. Research in early childhood pedagogy highlights that excessive focus on product-oriented outcomes can reduce opportunities for children to explore and refine motor skills through meaningful practice (Kasanen et al., 2024). Therefore, a quantitative investigation of structured coloring interventions is needed to provide objective evidence of their effectiveness. By measuring specific indicators such as pencil grip maturity, coloring accuracy, pressure control, flexibility, and task completion time across multiple sessions, this study offers a systematic evaluation model for fine motor stimulation practices.

Therefore, this study aims to examine the effect of structured picture-coloring activities on the fine motor skills of children in Group B2 at Bungamputi Kindergarten, Palu, using a quasi-experimental approach. By providing empirical evidence, this research contributes to strengthening evidence-based pedagogical strategies for enhancing fine motor development in early childhood education settings.

2. METHOD

This study employed a quantitative approach using a quasi-experimental design. Specifically, the research applied a one-group pretest–posttest design without a control or comparison group. This design allows the researcher to measure changes in participants' fine motor skills before and after the intervention.

In this design, participants were given a pretest to assess their initial level of fine motor skills. Subsequently, they received the intervention in the form of structured picture-coloring activities conducted over six sessions. After the intervention period, a posttest was administered to measure any improvements in fine motor performance. The difference between pretest and posttest scores was analyzed to determine the effect of the coloring activities on children's fine motor skills.

3. RESULTS AND DISCUSSION

Three aspects of fine motor skills were assessed in this study: (1) coloring strength (pencil grip control and pressure regulation), (2) coloring flexibility (finger and wrist movement coordination), and (3) coloring speed (task completion efficiency). Each aspect consisted of four specific indicators that served as measurement criteria for evaluating children's fine motor development.

The study was conducted over a three-week period, from December 4 to December 21, 2023. During this time, children participated in structured coloring activities designed to stimulate and measure improvements in fine motor performance.

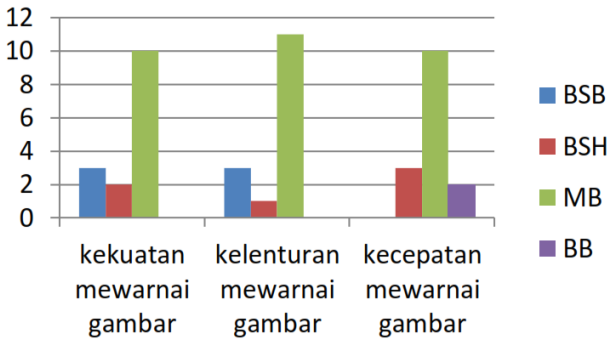

Figure 1. Pre-Intervention Fine Motor Skills (Before Coloring Activities)

Based on Figure 1 (Histogram 1.1), the distribution of children's fine motor skills prior to the coloring intervention can be described according to the observed aspects. In the coloring strength aspect, the majority of children (66.67%) were categorized as Beginning to Develop (MB). Meanwhile, 20% were in the Very Well Developed (BSB) category, and 13.33% were classified as Developing as Expected (BSH). For the coloring flexibility aspect, most children (73.33%) were in the Beginning to Develop (MB) category. A total of 20% were categorized as Very Well Developed (BSB), 6.67% as Developing as Expected (BSH), and none (0%) were classified as Not Yet Developed (BB). Regarding the coloring speed aspect, 66.67% of children were in the Beginning to Develop (MB) category, 20% were categorized as Developing as Expected (BSH), and 13.33% were in the Not Yet Developed (BB) category. No children (0%) reached the Very Well Developed (BSB) category in this aspect. Overall, these findings indicate that before the intervention, most children's fine motor skills were still in the Beginning to Develop category across all assessed aspects.

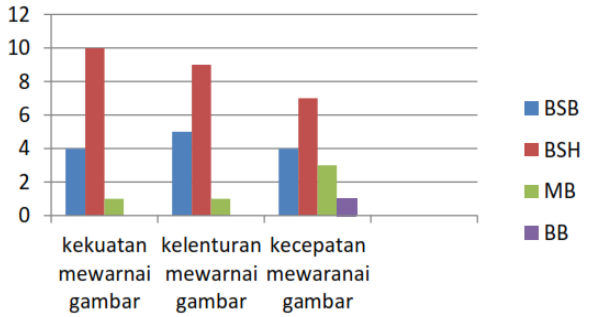

Figure 2. Post-Intervention Fine Motor Skills (After Coloring Activities)

Based on Figure 2 (Histogram 1.2), the distribution of children's fine motor skills after the implementation of the coloring intervention demonstrates substantial improvement across all observed aspects. In the coloring strength aspect, 26.67% of children were categorized as *Very Well Developed (BSB)*, 66.67% as *Developing as Expected (BSH)*, and only 6.66% remained in the *Beginning to Develop (MB)* category. No children (0%) were classified as *Not Yet Developed (BB)*. For the coloring flexibility aspect, 33.33% of children reached the *BSB* category, 60% were in the *BSH* category, and 6.66% were categorized as *MB*. Similar to the strength aspect, none of the children (0%) were in the *BB* category. Regarding the coloring speed aspect, 26.67% of children were categorized as *BSB*, 46.67% as *BSH*, 20% as *MB*, and 6.66% remained in the *BB* category. Overall, these results indicate a marked shift from the *Beginning to Develop* category toward the *Developing as Expected* and *Very Well Developed* categories following the coloring activities. This distribution suggests that structured coloring interventions contributed positively to the improvement of children's fine motor skills.

A. Strength Aspect of Coloring Activities

Fine motor skills play an essential role in supporting children's early academic development (Falera, 2024). Preschool children naturally show enthusiasm for light motor activities such as drawing, coloring, painting, cutting, and pasting (Ditha et al., 2025). Among these activities, coloring provides meaningful educational value because it trains children to regulate hand movements, control pressure, and maintain precision within boundaries (Khusnaini et al., 2025). Repetitive hand practice through structured coloring tasks gradually enhances children's ability to coordinate finger and wrist movements effectively.

During the coloring process, children learn to control the pressure applied to coloring tools, ensure that colors remain within outlines, and avoid overlapping with adjacent areas. This activity also fosters patience, persistence, and attention to detail, as children are encouraged to complete tasks carefully and neatly. Over time, consistent practice leads to improved muscle strength and stability in hand movements, which are critical components of fine motor development. Studies on early childhood motor development show that repeated hand-based activities such as drawing and coloring strengthen hand muscles and improve coordination between fingers, wrists, and visual control (Lestari et al., 2024)

Observations were conducted with 15 children in Group B2 at Bungamputi Kindergarten, Palu, over a three-week period. In the initial observation (pre-intervention), the strength aspect of coloring showed that 20% of children were categorized as *Very Well Developed (BSB)*, 13.33% as *Developing as Expected (BSH)*, and the majority (66.67%) as *Beginning to Develop (MB)*. None of the children were classified as *Not Yet Developed (BB)*.

Following the implementation of structured coloring activities, the distribution shifted considerably. In the final observation (post-intervention), 26.67% of children reached the *BSB* category, 66.67% were categorized as *BSH*, and only 6.66% remained in the *MB* category, with no children in the *BB* category. This indicates a substantial decrease in the proportion of children in the *Beginning to Develop* category and a corresponding increase in higher developmental levels.

Based on these findings, it can be concluded that structured coloring activities positively influenced the strength aspect of children's fine motor skills. The observed improvement demonstrates that repeated and guided coloring practice effectively enhances children's hand muscle control and movement stability. These results support the view that structured visual-motor activities serve as an effective strategy for stimulating fine motor development in early childhood education settings.

B. Flexibility Aspect of Coloring Activities

Fine motor development in kindergarten emphasizes finger flexibility, particularly the coordinated movement of the thumb and index finger. Flexibility refers to the ability of a body segment to move optimally within its range of motion (Rezieka et al., 2022). In early childhood education, training flexibility is essential to prepare children for writing readiness, object manipulation, and other tasks requiring controlled finger movements.

The development of fine motor flexibility aims to enhance children's readiness for writing, improve task persistence, and foster confidence in completing activities involving small muscle coordination. Fine motor development enables children to perform coordinated physical activities, including flexibility, balance, agility, and expressive creativity using various media. Through structured motor practice, children gradually gain better control of their finger movements and hand coordination (Atqiya, 2024).

Coloring activities, particularly those using crayons or colored pencils, serve as effective tools for training finger flexibility. During coloring, children practice adjusting grip position, regulating wrist movement, and distributing hand pressure evenly across surfaces. The act of coloring evenly within outlines requires smooth and controlled finger movements, thereby strengthening flexibility and fine motor precision (Erma Noor Wahyuningsih et al., 2025).

Observations were conducted with 15 children in Group B2 at Bungamputi Kindergarten, Palu, over a three-week period. In the initial observation (pre-intervention), the flexibility aspect showed that 20% of children were categorized as *Very Well Developed (BSB)*, 6.66% as *Developing as Expected (BSH)*, and the majority (73.33%) as *Beginning to Develop (MB)*. No children were categorized as *Not Yet Developed (BB)*.

After the implementation of structured coloring activities, notable improvement was observed. In the final observation (post-intervention), 33.33% of children reached the *BSB* category, 60% were classified as *BSH*, and only 6.66% remained in the *MB* category, with none in the *BB* category. This shift indicates a significant decrease in the proportion of children at the *Beginning to Develop* level and a substantial increase in the higher developmental categories.

These findings suggest that structured coloring activities positively influenced children's finger flexibility. Children demonstrated improved pencil grip patterns, reduced stiffness in finger movements, and more controlled wrist coordination. With consistent teacher guidance and supervision, children transitioned from gripping tools rigidly to holding them using a more mature tripod grasp. As a result, coloring activities were completed more comfortably and accurately, reflecting enhanced fine motor flexibility.

Overall, the results support the conclusion that structured and guided coloring activities effectively stimulate the flexibility component of fine motor development in early childhood education settings.

C. Speed Aspect of Coloring Activities

Children develop motor skills through processes such as trial and error, imitation, and repeated practice. When children receive appropriate guidance and structured opportunities to practice, the development of motor skills can be evaluated through several indicators, including speed, accuracy, strength, and readiness in performing specific tasks (Ilham Surya Fallo, Suharjana, 2024) . Among these indicators, speed reflects the efficiency with which children complete motor activities while maintaining accuracy and control.

Fine motor development can be stimulated through systematic and repeated exercises such as tracing shapes, cutting and pasting, drawing, and coloring. Training is a structured and programmed process carried out repeatedly to develop and strengthen specific skills (Parulian et al., 2025) .In early childhood education, structured practice is essential to improve children's visual–motor coordination and task efficiency.

The primary goal of fine motor development for children aged 4–6 years is to enhance coordination between both hands and the eyes, prepare children for writing readiness, and enable them to manipulate objects with control and emotional regulation (Damayanti et al., 2020). Coloring activities, particularly using crayons or colored pencils, provide opportunities for children to practice even strokes, regulate movement direction, and combine colors effectively (Nurhayati, 2020). When performed consistently, these activities improve not only coordination but also task completion speed.

Observations were conducted with 15 children in Group B2 at Bungamputi Kindergarten, Palu, over a three-week period. During the initial observation (pre-intervention), the speed aspect showed that none of the children (0%) were categorized as *Very Well Developed (BSB)*, 20% were in the *Developing as Expected (BSH)* category, 66.67% were classified as *Beginning to Develop (MB)*, and 13.33% were categorized as *Not Yet Developed (BB)*. These findings indicate that most children required considerable time to complete coloring tasks and had not yet developed efficient motor performance.

Following the implementation of structured coloring activities, notable improvement was observed. In the final observation (post-intervention), 26.67% of children reached the *BSB* category, 46.67% were categorized as *BSH*, 20% remained in the *MB* category, and only 6.66% were classified as *BB*. This distribution reflects a significant shift from lower developmental categories toward higher performance levels.

The findings suggest that structured coloring activities positively influenced the speed component of children's fine motor skills. With repeated practice and teacher guidance, children demonstrated increased efficiency in completing coloring tasks while maintaining accuracy. Time-bound activities allowed teachers to monitor children's progress objectively and encouraged children to develop better focus, endurance, and motor coordination. Overall, the improvement in task completion speed indicates that systematic coloring exercises can effectively enhance the efficiency dimension of fine motor development in early childhood education settings.

4. CONCLUSION

The results of this study indicate that coloring activities have a positive effect on improving children's fine motor skills. After the treatment, most children showed development in the aspects of strength, flexibility, and speed when coloring pictures. Overall, coloring activities can support the development of children's fine motor skills and can be used as an effective learning activity in early childhood education.

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