

The Effect of Using Coloring Activities on the Concentration and Fine Motor Skills of Kindergarten B Students at Al Muhajir Islamic Kindergarten

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Abstract

This research examined whether structured coloring activities could strengthen learning concentration and fine motor performance among Kindergarten B children at Al Muhajir Islamic Kindergarten, Bandung. A one-group pretest-posttest design was applied to 25 children aged 6–7 years who joined the school's extracurricular coloring program. Data were obtained through a 24-item observation instrument covering concentration and fine motor indicators. Instrument testing showed that every item met the validity criterion, with item correlations exceeding the critical value of 0.396. The scales also demonstrated very high internal consistency, with Cronbach's alpha coefficients of 0.976 for concentration and 0.972 for fine motor skills. Shapiro-Wilk testing confirmed that the score differences were normally distributed, allowing the use of paired-samples t-tests. The findings revealed a statistically significant rise in concentration, with the mean score increasing from 35.04 before the activity to 38.48 afterward, $p = .039$. In contrast, the change in fine motor performance was not statistically significant, $p = .373$. These findings suggest that structured coloring can be used to support children's attention during learning activities, although a brief intervention may not be sufficient to generate measurable improvement in fine motor development.

Keywords: Structured Coloring Activities, Concentration, Fine Motor Skills, Early Childhood, Kindergarten B

1. Introduction

1.1 Background of the Issue

Kindergarten provides an important setting for supporting children's cognitive, attentional, and motor development before they enter primary school. Early childhood is marked by rapid growth across developmental domains, making age-appropriate and consistent stimulation especially important (Sastri, P. D., 2022). Within classroom activities, concentration enables children to attend to instructions and remain engaged with a task, whereas fine motor skills support controlled movements involving the hands, fingers, and visual-motor coordination (Akbar & Sastri, 2024).

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Concentration and fine motor skills are closely connected to children's participation in early learning activities. Children who can sustain attention are better able to follow demonstrations, complete sequential tasks, and resist distractions ([Nurlela & Ekanesia, 2025](#)). Evidence from early childhood learning contexts indicates that engaging activities can help strengthen concentration when they require children to focus on clear instructions and complete a defined task ([Hutagalung & Tangkin, 2023](#); [Rusydiana et al., 2023](#)).

Fine motor skills involve precise and coordinated use of the small muscles of the hands and fingers. These skills are required for drawing, writing, cutting, manipulating small objects, and other school-readiness activities. Coloring provides repeated opportunities to control a coloring tool, regulate pressure, coordinate hand and eye movements, and work within visual boundaries ([Fitrianingsih & Sari, 2019](#); [Ruminem et al., 2023](#)).

Structured coloring activities were implemented as part of the regular extracurricular program at Al Muhajir Islamic Kindergarten. In these activities, the teacher introduced the task, demonstrated the expected coloring procedure, and guided the children through sequential stages. The children were asked to attend to the demonstration, begin the task, select colors, control the coloring tool, work within the picture outlines, and complete the assigned picture. Although guidance was provided, children retained opportunities to make age-appropriate choices and express creativity.

Unlike free coloring, structured coloring activities combine creative participation with explicit instructions and teacher demonstration. This structure may support concentration because children must attend to a sequence of directions and sustain engagement until the task is completed. It may also provide practice in hand control and visual-motor coordination. Previous studies have reported that coloring activities can contribute to fine motor stimulation in preschool children, particularly when they are conducted regularly and supported by appropriate guidance ([Fitrianingsih & Sari, 2019](#); [Rahma & Rizki, 2022](#); [Ruminem et al., 2023](#)).

Initial observations at Al Muhajir Islamic Kindergarten indicated that several Kindergarten B children had difficulty maintaining attention until the coloring task was completed. Some children were also inconsistent in holding and controlling coloring tools, coloring within outlines, and producing an even finish. These observations provided the practical basis for examining whether children's concentration and fine motor scores differed before and after participation in structured coloring activities.

Research on early childhood stimulation suggests that developmental gains depend on the quality, consistency, and duration of the activities provided. Supportive guidance can create conditions for children to remain engaged, whereas repeated motor practice is generally needed before changes in precision and coordination become measurable ([Zain & Iswinarti, 2024](#)). These considerations support examining concentration and fine motor skills as separate outcomes rather than assuming that both will change at the same rate.

Accordingly, this study examined changes in the concentration and fine motor skill scores of Kindergarten B students following structured coloring activities at Al Muhajir Islamic Kindergarten.

1.2 Problem Statement

Based on the background described above, the research questions were: (1) Do the concentration scores of Kindergarten B students differ between the pretest and posttest

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measurements following structured coloring activities? and (2) Do their fine motor skill scores differ between the pretest and posttest measurements following structured coloring activities?

1.3 Research Objectives

This study aimed to: (1) examine whether children's concentration scores differed between the pretest and posttest measurements following structured coloring activities; and (2) examine whether their fine motor skill scores differed between the pretest and posttest measurements following the same activities.

2. Literature Review

2.1 Structured Coloring Activities

Coloring is frequently used in early childhood education because it integrates visual attention, color selection, instruction following, hand control, and creative expression. During structured coloring activities, children are expected to observe the task, regulate the movement and pressure of the coloring tool, and complete the picture within defined boundaries. [Rahma and Rizki \(2022\)](#) describe coloring as an activity that can support fine motor practice while fostering creativity. In the present study, the structured approach involved teacher demonstration and sequential guidance rather than unrestricted free coloring.

[Fitrianingsih and Sari \(2019\)](#) found that picture-coloring activities supported fine motor development in young children. Related evidence also indicates that repeated coloring practice can strengthen hand control and visual-motor coordination when the tasks are appropriate to children's developmental level ([Ruminem et al., 2023](#)). These findings provide a rationale for examining structured coloring activities as a classroom-based form of stimulation.

2.2 Concentration in Early Childhood Learning

Concentration is a child's ability to focus their attention on a specific activity for a certain period of time without being easily distracted by other stimuli. According to [Hutagalung and Tangkin \(2023\)](#), concentration is the ability to focus one's attention on the object of a task so that a child can understand, process information, and complete activities successfully. In early childhood, this ability has not yet fully developed, so it requires stimulation through activities that are engaging and meaningful to the child.

In early childhood, concentration can be observed through behaviors such as attending to the teacher's explanation, beginning the assigned activity, maintaining focus, resisting distractions, responding appropriately, and remaining engaged until the task is completed. [Rusyidiana et al. \(2023\)](#) emphasize observable attention to instructions and active participation, while [Hutagalung and Tangkin \(2023\)](#) highlight the importance of meaningful activities for sustaining children's focus.

2.3 Fine Motor Skills in Early Childhood

Fine motor skills involve the use of small muscles in the fingers and hands to perform movements requiring precision, coordination, and control ([Ruminem et al., 2023](#)). These skills are important for activities such as writing, drawing, cutting, and buttoning clothes. Between the ages of 5 and 6, a child's fine motor skills development reaches a critical stage, during which the child begins to hold writing instruments correctly, control hand movements more steadily, and complete tasks with greater precision.

The fine motor indicators used in this study focused on behaviors directly observable during

coloring: holding the coloring tool appropriately, controlling finger and hand movements, coloring within the outlines, coordinating visual information with hand movements, applying color evenly, and completing the picture neatly. These indicators are consistent with the motor demands described in studies of coloring-based stimulation among preschool children (Fitrianingsih & Sari, 2019; Rahma & Rizki, 2022; Ruminem et al., 2023).

2.4 Research Hypothesis

Based on the theoretical review and conceptual framework outlined above, the hypotheses proposed in this study are as follows:

H₀₁: Children's concentration scores do not differ significantly between the pretest and posttest measurements following structured coloring activities.

H₀₂: Children's fine motor skill scores do not differ significantly between the pretest and posttest measurements following structured coloring activities.

H₁: Children's concentration scores differ significantly between the pretest and posttest measurements following structured coloring activities.

H₂: Children's fine motor skill scores differ significantly between the pretest and posttest measurements following structured coloring activities.

3. Research Design

3.1 Research Design

This study used a quantitative one-group pretest-posttest design. The same children were observed before and after the structured coloring activities, and the two measurement occasions were compared separately for concentration and fine motor skills. Because the design did not include a control group, the analysis was intended to identify within-group change and was not used to establish definitive causality.

The intervention was structured coloring activities (X), while the measured outcomes were concentration (Y1) and fine motor skills (Y2). Table 1 presents the conceptual definitions, operational definitions, and indicators used in the study.

Table 1. Operationalization of Variables

Variables	Conceptual Definition	Operational Definition	Indicators
Structured Coloring Activities (X)	Teacher-guided coloring activities that involve visual attention, sequential instructions, and controlled use of coloring tools	Extracurricular coloring activities delivered through teacher explanation, demonstration, guided practice, and task completion for Kindergarten B students aged 6–7 years	1. Holding the coloring tool correctly 2. Moving the coloring tool properly 3. Coloring according to the pattern 4. Neatness in coloring 5. Completing the task
Academic Concentration	A child's ability to focus on an	Measured through observation during the	1. Attends to the teacher's instructions

Variables	Conceptual Definition	Operational Definition	Indicators
(Y1)	activity for a certain period of time	coloring activity	2. Begins the activity promptly 3. Maintains focus on the task 4. Resists distractions 5. Completes the assigned task 6. Sustains attention until completion
Fine Motor Skills (Y2)	A child's ability to use the small muscles of the fingers and hand-eye coordination	Kindergarten B students' ability to control finger movements and hand-eye coordination while coloring	1. Holds the coloring tool appropriately 2. Moves the fingers and hand in a controlled manner 3. Colors within the outlines 4. Demonstrates hand-eye coordination 5. Applies color evenly 6. Completes the coloring task neatly

Source: Adapted from previous theories and research

3.3 Population and Sample

The population consisted of all 25 Kindergarten B students who participated in the coloring extracurricular program at Al Muhajir Islamic Kindergarten. The group included 3 boys and 22 girls aged 6–7 years. Because the entire accessible population was included, the study used total sampling.

3.4 Data Collection Methods

Data were collected through structured observation at two measurement occasions. Before the structured coloring activities, each child completed a pretest coloring task and was rated on concentration and fine-motor indicators. The teacher then implemented the structured coloring procedure by explaining the task, demonstrating the expected steps, guiding children through the activity, and allowing them to complete the picture. A posttest observation using the same indicators was conducted after the intervention period. Using the same observation framework for both measurements enabled a direct comparison of each child's scores.

The observation instrument contained 24 items: 15 items for concentration and 9 items for fine motor skills. Each item was rated using the same response scale at pretest and posttest. Concentration items assessed attention to instructions, task initiation, sustained focus, resistance to distraction, persistence, and task completion. Fine motor items assessed tool grip, controlled movement, conformity to patterns or outlines, visual-motor coordination, even application of color, and neat completion. Photographs, completed observation sheets, and field notes were retained as supporting documentation.

3.5 Data Quality Test

Validity Test

Item-level evidence was examined using item-total correlations. With $N = 25$ and $df = 23$, the critical correlation value was .396 at the selected significance level. Items with obtained correlations exceeding .396 were retained. This procedure was treated as evidence of item discrimination and internal consistency rather than as comprehensive proof of construct validity.

Reliability Assessment

Internal consistency was evaluated separately for the 15-item concentration scale and the 9-item fine motor skills scale using Cronbach's alpha. Coefficients of .70 or higher were interpreted as acceptable for research use.

Normality Test

The distributional assumption was evaluated using the Shapiro-Wilk procedure, which was selected because the study involved a relatively small sample of 25 participants. The null hypothesis stated that the difference scores followed a normal distribution, whereas the alternative hypothesis stated that they did not. Statistical significance was evaluated at the .05 level.

Hypothesis Testing

The choice of inferential test was determined by the outcome of the normality assessment. When the difference scores satisfied the normality assumption, pretest and posttest scores were compared using a paired-samples t -test. When the assumption was not met, the Wilcoxon signed-rank test was used as the nonparametric alternative. The null hypothesis was rejected when the p -value was below .05. When the p -value was .05 or higher, the analysis failed to reject the null hypothesis.

4. Results and Discussion

This section presents the pretest and posttest results for the concentration and fine motor skill scores of 25 Kindergarten B students who participated in structured coloring activities at Al Muhajir Islamic Kindergarten.

4.1 Descriptive Statistics

Descriptive analysis was conducted on pretest and posttest scores from 25 participants. Before the intervention, concentration scores ranged from 22 to 45, with a mean of 35.04 and a standard deviation of 7.558. Fine motor scores varied between 12 and 27, producing a mean of 21.80 and a standard deviation of 4.564.

Following the structured coloring activities, concentration scores ranged from 29 to 45. The mean increased to 38.48, while the standard deviation decreased to 4.691. Fine motor scores ranged from 14 to 27, with a mean of 22.72 and a standard deviation of 4.037.

Overall, both variables showed higher minimum and mean scores at posttest. The descriptive results therefore indicate improvement in children's concentration and fine motor performance after participation in the coloring activities. However, statistical testing was still required to determine whether these changes were significant.

Table 2. Descriptive Statistics for Pretest Scores

	<i>N</i>	Minimum	Maximum	Mean	Std. Deviation
Concentration (Pretest)	25	22	45	35.04	7.558
Fine Motor (Pretest)	25	12	27	21.80	4.564
Valid N (listwise)	25				

Table 3. Post-test Descriptive Statistics

	<i>N</i>	Minimum	Maximum	Mean	Std. Deviation
Concentration (Posttest)	25	29	45	38.48	4.691
Fine Motor (Posttest)	25	14	27	22.72	4.037
Valid N (listwise)	25				

4.2 Item Validity

The observation instrument comprised 24 items, including 15 items measuring concentration and nine items assessing fine motor skills. Each item was evaluated by comparing its obtained correlation coefficient with the critical value of 0.396. An item was considered valid when its correlation coefficient exceeded the critical value.

Table 4. Item Validity Results

No.	Item Code	Dimension	Observed Item	Obtained <i>r</i>	Critical <i>r</i>	Decision
1	Y1.1	Focus of Attention	Pays attention to the teacher's explanation	.806	.396	Valid
2	Y1.2	Focus of Attention	Remains focused despite distractions	.605	.396	Valid
3	Y1.3	Focus of Attention	Directs attention toward the assigned task	.854	.396	Valid
4	Y1.4	Persistence / Industry	Completes the task from beginning to end	.922	.396	Valid
5	Y1.5	Persistence / Industry	Persists when encountering a difficult task	.914	.396	Valid
6	Y1.6	Persistence / Industry	Tries again after making a mistake or failing	.933	.396	Valid
7	Y1.7	Sense of Competence	Demonstrates confidence while completing the task	.892	.396	Valid
8	Y1.8	Sense of Competence	Shows pride in the completed work	.947	.396	Valid
9	Y1.9	Sense of Competence	Is willing to attempt a new task	.941	.396	Valid
10	Y1.10	Self-Control in Learning	Resists environmental stimuli that may interfere with attention	.746	.396	Valid

11	Y1.11	Self-Control in Learning	Follows the rules and instructions given by the teacher	.914	.396	Valid
12	Y1.12	Self-Control in Learning	Waits patiently for their turn	.916	.396	Valid
13	Y1.13	Active Engagement	Participates actively in the activity	.869	.396	Valid
14	Y1.14	Active Engagement	Responds appropriately to the teacher	.898	.396	Valid
15	Y1.15	Active Engagement	Demonstrates enthusiasm during learning activities	.885	.396	Valid
16	Y2.1	Hand-Eye Coordination	Draws basic shapes such as circles, squares, and triangles	.942	.396	Valid
17	Y2.2	Hand-Eye Coordination	Holds a writing tool using three fingers, with the middle finger as support	.780	.396	Valid
18	Y2.3	Hand-Eye Coordination	Follows the provided drawing pattern	.928	.396	Valid
19	Y2.4	Drawing Skills	Draws details according to the teacher's instructions	.872	.396	Valid
20	Y2.5	Drawing Skills	Produces drawings with appropriate neatness and proportion	.840	.396	Valid
21	Y2.6	Coloring Skills	Colors within the outlines of the picture	.910	.396	Valid
22	Y2.7	Coloring Skills	Applies colors neatly and consistently	.942	.396	Valid
23	Y2.8	Hand Movement Control	Controls pressure while drawing and coloring	.964	.396	Valid
24	Y2.9	Hand Movement Control	Moves the hand flexibly during drawing and coloring activities	.964	.396	Valid

The obtained correlation coefficients ranged from 0.605 to 0.964, all of which exceeded the critical coefficient of 0.396. Thus, every observation item satisfied the validity criterion and was retained for subsequent analysis.

4.3 Internal Consistency

The internal consistency of each observation scale was examined using Cronbach's alpha. The concentration scale, consisting of 15 items, produced an alpha coefficient of 0.976, while the nine-item fine motor skills scale yielded a coefficient of 0.972.

Table 5. Reliability Results

Variable	Number of Items	Cronbach's Alpha	Interpretation
Concentration	15	0.976	Highly reliable
Fine Motor Skills	9	0.972	Highly reliable

Both coefficients were substantially above the minimum criterion of 0.60. These results indicate that the items within each scale demonstrated very high internal consistency and were sufficiently reliable for further statistical analysis.

4.4 Normality Assessment

Before comparing the pretest and posttest scores, the distribution of the difference scores was evaluated. The Shapiro-Wilk procedure was used because the study involved 25 participants. The null hypothesis stated that the difference scores were normally distributed, whereas the alternative hypothesis stated that they were not. The criterion for statistical significance was set at .05.

Table 6. Shapiro-Wilk Normality Test

Difference Score	Shapiro-Wilk Statistic	df	p
Concentration	.953	25	.287
Fine Motor Skills	.963	25	.485

The Shapiro-Wilk results were nonsignificant for both concentration, $W = .953$, $p = .287$, and fine motor skills, $W = .963$, $p = .485$. Because both p values exceeded .05, there was insufficient evidence to reject the assumption of normality. Paired-samples t -tests were therefore used to compare the pretest and posttest scores.

4.5 Pretest-Posttest Comparisons

4.5.1 Concentration

Table 7. Mean Concentration Scores Before and After the Structured Coloring Activities

Measurement	N	Mean	Standard Deviation
Pretest	25	35.04	7.558
Posttest	25	38.48	4.691

The mean concentration score increased from 35.04 before the structured coloring activities to 38.48 after their completion. This represents an average gain of 3.44 points. The reduction in score variability at posttest also suggests that the children's concentration levels became more homogeneous following the intervention.

Table 8. Paired-Samples t Test for Concentration Scores

Comparison	Mean Difference	t	df	p
Pretest-Posttest Concentration	-3.440	-2.189	24	.039

The paired-samples analysis identified a statistically significant difference in concentration scores between the two measurement occasions, $t(24) = -2.189$, $p = .039$. The posttest mean was higher than the pretest mean. This result supports the presence of a significant within-group improvement following the structured coloring activities. Because no control group was included, the difference should not be interpreted as definitive evidence that the activities alone caused the improvement.

4.5.2 Fine Motor Skills

Table 9. Mean Fine Motor Skill Scores Before and After the Structured Coloring Activities

Measurement	N	Mean	Standard Deviation
Pretest	25	21.80	4.564
Posttest	25	22.72	4.037

Fine motor scores rose from a pretest mean of 21.80 to a posttest mean of 22.72. Accordingly, the children showed an average increase of 0.92 points, not a decrease. Although the direction of change was positive, inferential testing was required to determine whether the improvement exceeded what might be expected from sampling variation.

Table 10. Paired-Samples t Test for Fine Motor Skill Scores

Comparison	Mean Difference	t	df	p
Pretest-Posttest Fine Motor Skills	-0.920	-0.908	24	.373

The difference in fine motor skill scores was not statistically significant, $t(24) = -0.908$, $p = .373$. Although the posttest mean was 0.92 points higher, the evidence was insufficient to conclude that a reliable within-group change occurred during the study period.

4.6 Discussion

Children's concentration scores increased significantly after the structured coloring activities. The activity required them to attend to the teacher's demonstration, follow a sequence of instructions, direct attention to a defined visual task, and remain engaged until completion. This interpretation is consistent with research showing that meaningful, clearly organized early childhood activities can support sustained attention and participation ([Hutagalung & Tangkin, 2023](#); [Rusydiana et al., 2023](#)). The result should nevertheless be interpreted as a pretest-posttest improvement because maturation, familiarity with the task, and other uncontrolled influences cannot be excluded ([Ekanesia & Akbar, 2025](#)).

Fine motor skill scores showed a small descriptive increase, but the pretest-posttest difference was not statistically significant. Coloring involves grip control, regulated pressure, movement within outlines, and visual-motor coordination, so it remains relevant as a form of motor practice ([Fitrianingsih & Sari, 2019](#); [Rahma & Rizki, 2022](#); [Ruminem et al., 2023](#)). However, measurable motor development may require more sessions, longer practice, greater task variation, or activities that place stronger demands on finger dexterity than the intervention used in this study ([Mukaromah & Sastri, 2025](#); [Indillahi & Ekanesia, 2025](#)).

The contrasting findings suggest that concentration may respond more quickly to the immediate structure of teacher-guided activities, whereas fine motor improvement may depend more strongly on cumulative practice ([Febrianti & Ekanesia, 2025](#); [Ekanesia et al., 2023](#)). The very high internal consistency coefficients also warrant examination of whether some observation items were overly similar. In addition, the small sample, the absence of a control group, the limited information on intervention dosage, and possible observer effects restrict the generalizability of the findings. Future studies should use a longer intervention, equivalent pretest and posttest tasks, trained independent observers, and a comparison group.

5. Conclusion

The concentration scores of the participating children were significantly higher at posttest than at pretest following structured coloring activities supported by teacher demonstration. The

activities provided a clear sequence of instructions and a defined task that required sustained attention. Within the limits of the one-group design, structured coloring activities appear suitable as practical classroom activities for supporting concentration and task persistence.

Fine motor skill scores increased slightly, but the difference was not statistically significant. The study therefore did not provide sufficient evidence of measurable fine motor improvement during the intervention period. This pattern indicates that coloring alone, particularly when implemented for a limited duration, should not be treated as a complete strategy for developing fine motor skills.

Taken together, the findings showed a significant within-group change in concentration but not in fine motor skills. These conclusions pertain to score differences within the participating group and do not establish a causal effect, as the study lacked a control group.

Teachers are encouraged to use structured coloring activities as part of classroom practice, particularly when the objective is to strengthen children's attention and task persistence. Clear demonstrations, simple stages, and consistent guidance should be maintained so that children can follow the activity without losing focus. To provide broader motor stimulation, coloring should be combined with activities such as cutting, folding, tracing, threading beads, and manipulating small objects.

Schools should support these activities by allocating sufficient instructional time and providing varied, age-appropriate materials. Different coloring tools, drawing surfaces, patterns, and task levels may help sustain children's interest while creating more opportunities to practice hand control and visual-motor coordination.

Future studies should apply the intervention over a longer period and involve a larger sample. A design that includes a comparison or control group would also provide stronger evidence regarding the contribution of structured coloring to changes in concentration and fine motor skills. Researchers may also examine intervention duration, task difficulty, children's initial ability levels, and the combination of coloring with other fine-motor exercises.

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