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Hand-In-Hand Book: A Cooperative Play Intervention for Preschool Fine Motor Development

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ABSTRACT

Introduction *Fine motor development in preschool-aged children requires appropriate and ongoing stimulation. This study aimed to examine differences in changes in fine motor development between preschool-aged children receiving the Hand-In-Hand Book intervention and those receiving routine school activities.*

Methods *A quasi-experimental pretest-posttest control group design was employed involving 44 children aged 48–66 months from RA BA Aisyiyah Mlideg and TK Dharma Wanita Ngrandu, Bojonegoro Regency, with 22 children in each group. Total sampling was used, with group allocation conducted at the school level and one school representing each group. The intervention consisted of the Hand-In-Hand Book, a busy book combined with cooperative play, administered over 2 weeks in 10 sessions of 30 minutes each. Fine motor development was assessed using a researcher-developed observation sheet based on age-appropriate KPSP indicators. The primary outcome was the change in fine motor scores from pretest to posttest. Data were analyzed using the Mann–Whitney U test.*

Results *The proportion of children meeting the expected fine motor criteria in the intervention group increased from 18.2% at pretest to 100% at posttest, while no change was observed in the control group. A statistically significant difference in score changes was observed between groups ($U = 44.00$, $Z = -5.416$, $p < 0.001$), with a large effect size ($r = 0.82$).*

Discussion and Conclusion *However, because school site was completely confounded with intervention, the observed difference cannot be attributed solely to the intervention. Further studies using multiple schools and more rigorous allocation procedures are needed.*

Keywords*: hand in hand book, cooperative play, fine motor skills, preschool children, child development*

INTRODUCTION

Fine motor development constitutes a vital component of early childhood growth since it involves the coordinated use of small muscles, particularly those of the palms and digits to execute tasks that require precision and coordination between visual input and hand movement. These skills support preschool-aged children in carrying out everyday and learning-related activities, including sketching, producing written work, handling various objects, dressing, and other self-care tasks. Appropriate opportunities for practice and stimulation are therefore important to support the development of fine motor skills during the preschool period. During this period, children experience accelerated maturation and progress throughout various aspects, encompassing physical-motor, cognitive, linguistic, and socio-emotional development. One important aspect is fine motor development, which pertains to the capacity of coordinating manual muscle groups and digits to perform activities requiring precise and controlled movements, like sketching, handwriting, trimming, and fastening buttons [1], [2], [3].

Fine motor skills are essential for young learners' participation in daily activities and early learning experiences. Therefore, children need adequate opportunities and appropriate stimulation to develop fine motor abilities according to their developmental stage [4], [5]. Despite the importance of fine motor development, developmental difficulties may still be encountered among preschool-aged children. Fine motor abilities are influenced by various factors, including opportunities for stimulation, learning activities, environmental conditions, and the availability of appropriate play-based activities [2], [3], [4]. Early identification of difficulties is very important because early identification of developmental difficulties helps ensure that children receive the right stimulation and help that matches what children need [5]. Early identification of difficulties shows that we need new and engaging learning media that give children many chances to practice fine motor skills again and again through activities that matter to children.

In addition to the context early findings at the study site showed a similar issue. On October 4 2025 initial observations were carried out at RA BA Aisyiyah Mlideg in Kedungadem District, Bojonegoro Regency. The observations involved 10 aged children between 48 and 60 months old. The researcher and the school principal used an observation tool based on the KPSP guidelines for motor development appropriate to the children’s age. The results showed that 6 children or 60% had not yet reached the expected motor skills, for their age. Meanwhile 4 children or 40% showed

development that was age-appropriate. These preliminary findings suggest that fine motor development remains an area requiring attention at the study site and support the need for engaging, age-appropriate stimulation through play-based activities.

Delays in fine motor development can have various consequences for children. Kids suffering from fine motor delays tend to have difficulty performing daily activities demanding visual-motor integration, including handwriting, coloring, trimming materials, and taking care of themselves independently [3], [4], [6], [7]. These conditions may result in low self-esteem, limited participation within learning activities, and reduced academic readiness upon entering higher levels of education [8]. Therefore, appropriate stimulation is needed starting in preschool to optimize children's fine motor development [9].

Various studies have reported that interactive play-based media can support the development of fine motor skills in preschool-aged children. In particular, the use of busy book media has been associated with improvements in fine motor abilities, including activities involving hand coordination, manipulation, and controlled movements [2], [7], [10], [11], [12], [13]. Other play-based activities, such as loose-part collage and playbox activities, have also been reported to support fine motor development by providing opportunities for children to practice hand–eye coordination and object manipulation [10], [12]. These findings suggest that interactive and developmentally appropriate play materials may provide meaningful opportunities for fine motor stimulation. However, previous studies have generally examined busy book as a standalone educational medium, indicating a need to further explore its integration with cooperative play to provide both fine motor stimulation and opportunities for peer interaction.

Nevertheless, the majority of prior research has focused primarily on the utilization of busy books serving as a medium for individual learning. This approach is considered to not fully accommodate children's need to interact and collaborate with their peers during the developmental stimulation process. In fact, social interaction through shared play activities can provide a more meaningful learning experience and support the simultaneous development of various aspects, including motor, communication, and social-emotional skills [14], [15]. Several studies have also shown that cooperative play can increase children's engagement in learning activities through cooperation and communication among peers [14], [16].

Based on a focused literature search conducted through Google Scholar, PubMed, and

ProQuest, using the keywords “busy book,” “cooperative play,” “fine motor skills,” and “preschool children,” and focusing on publications from the previous 5–10 years, previous studies were identified that examined busy book media for fine motor stimulation as well as cooperative play in preschool-aged children. Studies on busy book have primarily focused on its development or use as a learning medium to stimulate children’s fine motor skills [2], [9], [11], [15], [17], [18], [19], whereas studies on cooperative play have examined children’s cooperation, peer interaction, and related developmental outcomes [10], [14], [20]. Based on this focused search, the identified studies generally addressed busy book-based fine motor activities and cooperative play as separate approaches. Therefore, the research gap addressed in the present study is the integration of a busy book-based fine motor stimulation activity with structured cooperative play in pairs. To address this gap, the present study developed the Hand-In-Hand Book, a busy book-based stimulation material implemented through paired cooperative play, in which children work together to complete various fine motor tasks. The distinctive value of this paper therefore is found in the merging of these two approaches within a single stimulation model for preschool-aged children, rather than in the use of busy book or cooperative play independently. This study aims to analyze differences in fine motor development between preschool-aged children receiving the Hand-In-Hand Book intervention and those receiving routine school activities. The conclusions are expected to add value to the development of play-based fine motor intervention materials alongside supplying an alternative approach for teachers, parents, and healthcare professionals in supporting fine motor development in preschool-aged children.

METHOD

Research Design

This research utilized a quantitative methodology by adopting a quasi-experimental design, specifically a pre-test–post-test design incorporating a control group. This methodological framework was employed in order to evaluate the impact of the Hand-In-Hand Book on the fine motor development of preschool-aged children by comparing changes within scores before and subsequent to the intervention concerning the intervention group along with the control group.

Research Location

The study was conducted at RA BA Aisyiyah Mlideg and TK Dharma Wanita Ngrandu in Bojonegoro Regency, East Java. Data collection took place in February–March 2026.

Research Participants

This research population comprised 44 preschool-aged children ranging between 48–66 months of age enrolled at RA BA Aisyiyah Mlideg and TK Dharma Wanita Ngrandu, Bojonegoro Regency, with 22 children from each school. A total sampling technique was applied, whereby every child within the target population who met the participation requirements were recruited. The participation requirements were being aged 48–66 months, being enrolled at one of the study schools, and having parental or guardian written permission. Children lacking parental or legal guardian approval did not consent did not participate in the study. For the intervention group, participants who were absent for more than three intervention sessions were predefined as not eligible for analysis. In the present study, however, all 44 participants completed both the pretest and posttest and none exceeded the predefined attendance threshold; therefore, no participant was excluded from the final analysis.

Because the subjects constituted members belonging to naturally formed school groups, allocation was conducted at the cluster level, with one school allocated to the intervention group along with the other designated for the control group. The intervention group received the Hand-In-Hand Book activities, while the control group maintained regular daily tasks. The final analyzed sample consisted of 44 children, with 22 children in each group. No a priori statistical power or sample-size computation was undertaken because this research encompassed the entire reachable population. Hence, the outcomes should be interpreted as preliminary, particularly because the intervention and school site were completely confounded.

Research Variables

The independent variable in this study is the use of the Hand-In-Hand Book, an educational medium based on a busy book combined with the cooperative play method. The dependent variable is the fine motor development of preschool-aged children.

Research Instruments

Data on fine motor development were collected using an Observation Sheet based on the Developmental Pre-Screening Questionnaire (KPSP) published by the Ministry of Health of the Republic of Indonesia. The assessment in this study focused on items that measure aspects of fine motor development according to the respondents' age groups. The KPSP is a standardized developmental screening instrument widely used in the Early Stimulation, Detection, and Intervention for Growth and Development (SDIDTK) program in Indonesia. In addition, a respondent characteristics form was used, which included the child's age, gender, parents' education level, and parents' occupation.

I checked the child's motor development by using a custom observation sheet that had chosen fine motor tasks taken from the KPSP matched to the child's age on the screening form. The assessment did not use the total KPSP score; rather, only the fine motor items relevant to the study outcome were recorded. Each task was scored 1 when the child was able to perform it according to the specified instruction and 0 when the child was unable to perform it or still required assistance. The fine motor score was calculated by summing the successfully performed items within the applicable age-specific form.

Age was determined according to the KPSP procedure based on the child's date of birth. KPSP screening ages are scheduled at 48, 54, 60, and 66 months within the study's 48–66-month age range. When a child's chronological age does not correspond to a scheduled screening age, the KPSP form for the immediately younger screening age is used. In the present study, after age determination according to this procedure, all 44 participants were assessed using one of four age-specific forms: 48, 54, 60, or 66 months. No participant was assigned to an intermediate age group outside these four forms. The distribution of participants by age-specific assessment form was therefore reported according to the actual KPSP form used rather than by broad categories such as "4 years" and "5 years."

Because the age-specific forms contained different numbers of fine motor items, raw scores were not directly combined across age groups for the primary analysis. To place scores on a common metric, the fine motor score was expressed as a proportion of the maximum score for the applicable age-specific form (observed score divided by the maximum possible score for that

form). Thus, the standardized fine motor score ranged from 0 to 1 across all age groups. Change in fine motor development was calculated as the posttest standardized score minus the pretest standardized score. This approach accounts for the different numbers of assessment items across age-specific forms while retaining the age-specific scoring criteria used in the observation instrument.

For descriptive interpretation, age-specific categorical classifications were also retained. For the 48- and 60-month forms, a maximum score of 2 indicated age-appropriate fine motor performance, whereas scores of 0–1 indicated not age-appropriate performance. For the 54- and 66-month forms, a maximum score of 3 indicated age-appropriate performance, whereas scores of 0–2 indicated not age-appropriate performance. These categorical classifications were analyzed separately from the standardized continuous score and were not used to calculate the standardized change score. The higher the standardized score, the greater the proportion of age-specific fine motor tasks successfully performed.

Research Procedures

The study began with obtaining research approval and securing signed parental or guardian authorization for the subjects. Every individual in the intervention and control groups subsequently underwent a baseline assessment (pre-test) of fine motor development using a researcher-developed observation sheet containing fine motor tasks based on age-specific KPSP indicators. The intervention group received the Hand-In-Hand Book intervention for two weeks, consisting of 10 intervention days with a frequency of one session per day and a duration of 30 minutes per session. Each session consisted of a 5-minute preparation phase, a 20-minute core activity, coupled with a 5-minute concluding period. The intervention was conducted using a cooperative play approach in pairs. At the beginning of each session, the researcher prepared the Hand-In-Hand Book and supporting materials according to the number of child pairs and divided the children into cooperative pairs. Each pair consisted of an Instructor and an Executor. The Instructor provided verbal instructions, while the Executor performed the instructed fine motor activity. After one sequence of activities was completed, the roles were exchanged so that both children had the opportunity to perform both roles.

The Hand-In-Hand Book activities consisted of seven structured activities: fastening

buttons; tying and untying laces; determining and changing the length of a lace to make it long or short; attaching and removing objects such as blocks or shapes; arranging and matching objects according to shape or size; opening and closing zippers or folds; and identifying and completing body parts. At the end of each session, the researcher provided reinforcement and appreciation, the children were encouraged to tidy the materials together, and observations were recorded on the fine motor development observation sheet. The intervention used the Hand-In-Hand Book, writing and supporting materials required for the tasks, a suitable room, attendance records, activity instruction sheets, and the fine motor observation sheet.

Attendance during the intervention was monitored using an attendance sheet. Participants who were absent for more than three intervention sessions were predefined as not eligible for analysis. In the present study, all 22 children in the intervention group completed the pre-test and post-test and none exceeded the predefined absence threshold; therefore, no participant was excluded from the final analysis.

The control group continued to receive routine learning activities according to the school curriculum during the two-week intervention period and did not receive the Hand-In-Hand Book or other similar interactive media. The routine learning activities were not standardized or controlled by the researcher. Therefore, the study did not provide an attention- or time-matched control condition, and the specific fine motor activities conducted as part of routine classroom learning were not controlled by the study protocol. This difference was taken into account when looking at the results because differences between groups could be due to more than exposure to the Hand-In-Hand Book. They might also stem from variations, in interaction, cooperative play or other activities happening in the classroom.

After the intervention finished both groups took a post-test that used the same observation tool and age-specific tests that the researchers used at the start. The researchers watched the children play and scored what they saw. Because the intervention could be seen during the study and the researcher did the scoring the researcher could not be kept blind to which group the child was, in. The same scoring rules were used for every child. One assessor did all the work so the study did not look at how consistent different assessors might be. Not having an assessor and not checking how consistent different assessors are are potential ways the study could have been biased and the researchers said this was a limitation.

Data Analysis

Univariate analysis was used to explain the features of the participants and how the fine motor development scores were spread out. Since the forms for age groups had different numbers of fine motor tasks the original scores could not be added together across age groups for the main analysis. So the fine motor score for each person was adjusted by dividing the score they got by the possible score for their age groups form. This gave a score that ranged from 0 to 1. This score showed how many of the motor tasks, for that specific age were done correctly.

The main thing we looked at in the comparison between groups was how the standardized fine motor score changed. We measured that change by taking the standardized fine motor score and subtracting the pre-test standardized fine motor score. Because the changes were discrete bounded and not normally distributed we chose to report the data with the median interquartile range (IQR) and range of just the mean and standard deviation. To compare the changes in fine motor scores, between the intervention group and the control group we ran a Mann–Whitney U test and we set the significance level at $\alpha = 0.05$. The results were reported using the Mann–Whitney U statistic, standardized Z statistic, p-value, and an appropriate effect-size estimate with its 95% confidence interval. As a sensitivity analysis, age-appropriate categorical fine motor development status (appropriate versus not appropriate) was also examined based on the predefined age-specific criteria. Additional stratified analyses by age-specific assessment form were considered to assess whether the findings were consistent across the different scoring ranges.

All 44 participants had complete pre-test and post-test outcome data. Therefore, no missing primary outcome data required imputation or other missing-data procedures, and no participant was excluded because of missing pre-test or post-test measurements. The analysis was conducted at the individual participant level; however, because one school constituted the intervention group and one school constituted the control group, school and intervention assignment were completely confounded. Consequently, the analysis could not independently estimate a school/cluster effect, and the findings were interpreted as exploratory associations rather than definitive causal effects of the Hand-In-Hand Book intervention.

Ethical Considerations

This study has received ethical approval from the Health Research Ethics Committee of Muhammadiyah University of Lamongan, under Ethical Clearance No. 028/EC/KEPK-

S1/02/2026. All parents or guardians of the respondents provided written consent prior to the study's implementation.

RESULTS

This study involved 44 preschool-aged children, comprising 22 children in the intervention group and 22 children in the control group. The characteristics of the participants based on gender, age, parental education, and parental occupation are presented in Table 1.

Table 1. Characteristics of Respondents by Gender, Age, Parental Education, and Parental Occupation

Characteristics	n	(%)
Gender		
Control Group		
Male	11	50,0
Female	11	50,0
Intervention Group		
Male	11	50,0
Female	11	50,0
Age		
Control Group		
4 years old	12	54,5
5 years old	10	45,5
Intervention Group		
4 years old	8	36,4
5 years old	14	63,6
Guardian's Education		
Control Group		
Elementary School	4	18,2
Junior High School	7	31,8
High School	10	45,5
College/University	1	4,5
Intervention Group		
Elementary School	0	0,0
Junior High School	6	27,3
High School	14	63,6
College/University	2	9,1
Guardian's Occupation		
Control Group		
Unemployed	1	4,5
Self-employed	20	90,9
Private Sector	1	4,5
College Professor	0	0,0
Civil Servant/Military/Police	0	0,0

Characteristics	n	(%)
Intervention Group		
Unemployed	5	22,7
Self-employed	15	68,2
Private Sector	0	0,0
College Professor	1	4,5
Civil Servant/Military/Police	1	4,5
Total	**44**	**(100,0)**

Based on Table 1, the distribution of sex was identical between the control and intervention groups, with 11 male and 11 female children in each group (50.0% each). Differences were observed in the age distribution between the two groups. In the control group, 54.5% of the children were aged 4 years and 45.5% were aged 5 years, whereas in the intervention group, 36.4% were aged 4 years and 63.6% were aged 5 years. This age difference is particularly relevant because the fine motor assessment used age-specific KPSP items, with different numbers of assessment items and maximum scores according to age.

Regarding the student guardians' education, the control group consisted of 18.2% elementary school, 31.8% junior high school, 45.5% high school, and 4.5% college/university education. In the intervention group, the corresponding proportions were 0.0%, 27.3%, 63.6%, and 9.1%, respectively. Regarding the student guardians' occupation, self-employment was the most common category in both groups, accounting for 90.9% in the control group and 68.2% in the intervention group. Other occupational categories were less frequently represented and differed between the two groups.

Overall, the descriptive characteristics show differences in baseline composition between the control and intervention groups, particularly in age and student guardians' characteristics. Therefore, the absence of a statistically significant baseline comparison should not be interpreted as evidence that the groups were equivalent. The age imbalance is particularly important because age determines the KPSP assessment form, the number of assessment items, and the corresponding maximum score. These baseline differences were considered when interpreting the between-group differences in fine motor development..

The distribution of fine motor development in preschool-aged children before (pre-test) the intervention in the control group and the intervention group is presented in Table 2.

Table 2. Fine Motor Development in Preschool-Aged Children in the Control Group and the Intervention Group Before the Intervention

Group	Fine Motor Skills Category		Total
	Appropriate	Inappropriate	
	n (%)	n (%)	
Control Group	7 (31,8)	15 (68,2)	22 (100,0)
Intervention Group	4 (18,2)	18 (81,8)	22 (100,0)
Total	11 (25,0)	33 (75,0)	44 (100,0)

Based on Table 2, most children in the control group were classified as having suboptimal fine motor development, totaling 15 children (68.2%), while in the intervention group, nearly all 18 children (81.8%) fell into this category. Meanwhile, 7 children (31.8%) in the control group and 4 children (18.2%) in the intervention group were classified as having appropriate fine motor development.

Table 3. Fine Motor Development in Preschool-Aged Children in the Control and Intervention Groups After the Intervention

Group	Fine Motor Skills Category		Total
	Appropriate	Inappropriate	
	n (%)	n (%)	
Control Group	7 (31,8)	15 (68,2)	22 (100,0)
Intervention Group	22 (100,0)	0 (0,0)	22 (100,0)
Total	29 (65,9)	15 (34,1)	44 (100,0)

Based on Table 3, all children in the intervention group fell into the “age-appropriate” category for fine motor development, totaling 22 children (100.0%). In the control group, the majority of children remained in the “not age-appropriate” category, totaling 15 children (68.2%), while 7 children (31.8%) fell into the “age-appropriate” category.

Table 4. Cross-Tabulation of Fine Motor Development in Preschool-Aged Children

No.	Variable	Control Group		Intervention Group		N	%	*Mean Rank*	*Z*	ρ-*value*
		(f)	(%)	(f)	(%)			*Gain Score*		
1.	Appropriate	7	31,8	22	100,0	29	65,9			
2.	Inappropriate	15	68,2	0	0,0	15	34,1			
	Total	**22**	**100,0**	**22**	**100,0**	**44**	**100,0**	**13,50/ 31,50**	***-5,416***	**0,000**

Table 4 presents the individual transitions in fine motor development status from pre-test to post-test in the control and intervention groups. In the intervention group, most children who were classified as having inappropriate fine motor development at pre-test transitioned to the

appropriate category at post-test, while the control group showed substantially less change. These transitions are presented separately for each group to account for the paired nature of the pre-test and post-test observations. The difference in improvement between groups was subsequently evaluated using the between-group analysis of standardized gain scores.

DISCUSSION

Fine Motor Development in Preschool-Aged Children in the Control Group and the Intervention Group Before the Introduction of the Hand-In-Hand Book

The research results, as shown in Table 2, indicate that the fine motor development of preschool-aged children prior to the intervention was almost entirely in the "not meeting standards" category. In the control group, the majority of children (68.2%) were in the "not meeting standards" category, while only a minority (31.8%) were in the "meeting standards" category. The intervention group also showed a relatively similar condition, with nearly all children—81.8%—in the "not on track" category, while a small portion—18.2%—were in the "on track" category. These results indicate that both the control and intervention groups had relatively similar baseline conditions, namely that many children still had suboptimal fine motor development.

Fine motor development refers to the ability to coordinate small muscles, particularly those of the fingers and wrists, and requires appropriate stimulation to support optimal development [2], [21]. During early childhood, increasing age is accompanied by ongoing maturation of the nervous system and the gradual acquisition of more complex developmental skills. However, the pace at which children achieve developmental milestones may vary, and development is influenced not only by biological maturation but also by the child's experiences and environment. In the present study, most children in both groups were classified as having inappropriate fine motor development at baseline despite being within the preschool age range. This finding suggests that chronological age and developmental maturation alone may not ensure that children achieve all expected fine motor skills. Adequate and sustained opportunities for learning, play, and stimulation are also important in supporting children's developmental progress.

Student guardians' characteristics may also be considered as contextual characteristics in children's fine motor development. In this study, most student guardians in both the control and

intervention groups had a high school education and were self-employed. These characteristics describe the background of the children's home environment but were not specifically analyzed as determinants of fine motor development in the present study. Despite the predominance of high school education and self-employment among student guardians, most children in both groups were classified as having inappropriate fine motor development at baseline. This finding suggests that demographic characteristics of the guardian alone cannot be used to explain children's fine motor development. Opportunities for appropriate and sustained stimulation are also important in supporting the development of fine motor skills. Previous evidence has shown that motor skill interventions can improve fine motor development in children, supporting the importance of providing developmentally appropriate opportunities for motor practice and stimulation [3], [4].

According to Suhartanti et al [4], Fine motor skills develop through various activities that involve hand-eye coordination, such as drawing, cutting, writing, arranging objects, and other manipulative activities. A lack of appropriate stimulation can lead to developmental delays in these areas [4], [7], [8], [22]. The findings of this study are consistent with the research by Hayyu and Suminar [20] which indicates that some preschool-aged children still experience delays in fine motor development due to a lack of opportunities to engage in structured stimulating activities. Another study by Kartikasari et al [8] also found that children who rarely engage in activities that develop hand-eye coordination tend to have poorer fine motor skills than children who receive regular stimulation.

The fact that fine motor development is not yet on track for most children may be influenced by the variety of stimulation they receive at home and at school. During the preschool years, children need learning experiences that involve hands-on and repetitive activities so that their fine motor skills can develop optimally [18], [23]. These findings highlight the importance of providing structured stimulation that is appropriate for a child's developmental stage to support the development of fine motor skills. From a perspective the results of this study reinforce the understanding that identifying the baseline status of fine motor development is crucial in determining the appropriate form of intervention, for preschool-aged children. By understanding the child's status before intervention programs that stimulate fine motor development can be designed to be more focused and specifically tailored to the child's needs.

Fine Motor Development in Preschool-Aged Children in the Control and Intervention Groups Following the Use of the Hand-In-Hand Book

The research results, as shown in Table 3 show that the fine motor development of preschool-aged children improved after they received the Hand-In-Hand Book intervention model. In the group that got the intervention every child. All 100.0%. Was placed in the "category. Not a single child, in this group fell into the "category, which was 0.0%. On the hand the control group did not see a noticeable improvement. This shows that the kind of stimulation offered by the Hand-In-Hand Book intervention model really works to enhance motor development in young children.

The small change in motor skills seen in the control group shows that growth in development might not be clear during a short time period unless there is more organized practice. The small change in motor skills seen in the control group shows that growth in development might not be clear, during a short time period unless there is more organized practice. Children may benefit from developmentally appropriate and consistent opportunities to practice fine motor skills. Previous research has demonstrated that motor skill interventions can support fine motor development in young children. In the present study, the intervention group showed greater improvement in fine motor development than the control group following the intervention. However, differences in baseline characteristics, particularly age and student guardians' characteristics, were present between the groups. Therefore, the observed between-group difference should be interpreted as an association with the Hand-In-Hand Book intervention rather than evidence that its effect was independent of these characteristics [11] [2].

According to child development theory, fine motor skills develop through opportunities to engage in activities that involve hand-eye coordination and the controlled use of small muscles. Repeated practice through developmentally appropriate activities can provide children with opportunities to refine their fine motor movements [3], [4]. Play can also serve as an appropriate learning context for preschool-aged children because it provides opportunities for children to actively practice skills through meaningful activities [14], [24]. The findings of this study are consistent with Nurhayati's study [2] which reported that the use of busy book media was associated with improvements in preschool children's fine motor skills. Other studies have also reported improvements in fine motor abilities following activities or media designed to provide opportunities for fine motor practice [7], [10], [11], [21], [25] These findings support the potential

use of structured, play-based activities such as the Hand-In-Hand Book to provide repeated opportunities for preschool children to practice fine motor skills.

In addition to providing opportunities for fine motor practice, the cooperative play component of the Hand-In-Hand Book may provide children with opportunities to learn through interaction with peers. During the activities, children could observe how their peers performed tasks, participate in shared activities, and receive opportunities to imitate or assist one another. These social interactions may have supported engagement during the intervention and provided additional opportunities to practice the targeted fine motor skills. However, because the present study did not specifically measure peer interaction, imitation, or social learning processes, these mechanisms should be considered as possible explanations rather than directly established mechanisms of the observed improvement. Thus, the greater improvement observed in the intervention group may reflect the combination of repeated fine motor practice and the play-based learning context provided by the Hand-In-Hand Book.

The improvement in fine motor development in the intervention group can be explained by the characteristics of the Hand-In-Hand Book, which provides a variety of manipulative activities such as buttoning, opening and closing zippers, matching shapes, tying laces, and matching pictures. These activities require simultaneous eye-hand coordination, thereby providing optimal stimulation for children's fine motor development. The scientific contribution of these findings indicates that stimulation using manipulative activities remains an effective strategy for enhancing fine motor development in preschool-aged children. These findings reinforce the evidence regarding the importance of stimulation tailored to children's developmental characteristics in the growth and development process [12], [19].

The Effect of the Hand-In-Hand Book on the Fine Motor Skills Development of Preschoolers

Table 4 presents the fine motor development status of preschool-aged children at post-test in the intervention and control groups. In the intervention group, all 22 children (100%) were categorized as having appropriate fine motor development, whereas 7 children (31.8%) in the control group were categorized as appropriate and 15 children (68.2%) as inappropriate. Overall, 29 children (65.9%) were categorized as having appropriate fine motor development and 15 children (34.1%) as inappropriate at post-test. These findings describe the distribution of fine motor development status at post-test and indicate a higher proportion of children with appropriate

fine motor development in the intervention group than in the control group.

The Mann–Whitney U test showed a statistically significant difference in fine motor development change between the intervention and control groups ($Z = -5.416$, $p < 0.001$), with a higher mean rank in the intervention group (31.50) than in the control group (13.50). These findings indicate that children in the intervention group experienced greater improvement in fine motor development than those in the control group. However, the results should be interpreted cautiously because the study used a quasi-experimental design with one school allocated to each group, differences in baseline characteristics between groups, no attention-matched control condition or blinding, and a relatively small sample size. Therefore, the findings suggest that the use of the Hand-In-Hand Book was associated with greater improvement in fine motor development in this sample, rather than providing definitive evidence of a causal effect.

Improvements in fine motor development in this study can also be observed based on the gain scores, which are the differences between the pre-test and post-test scores in each group. Based on the results of the Mann-Whitney test on the gain scores in Table 5, the mean rank in the intervention group was higher than that in the control group, namely 31.50 in the intervention group and 13.50 in the control group. This indicates that the improvement in fine motor development in the intervention group was greater than that in the control group after the Hand-In-Hand Book intervention was administered.

In theory, developmental stimulation provided through play activities can improve fine motor skills because children have the opportunity to repeatedly practice coordinating their movements in a fun environment [13], [24]. Theories of preschool-age learning also explain that active engagement in play provides a more meaningful learning experience than passive learning, because children learn through exploration and hands-on practice [25]. The results of this study are consistent with the study by Safitri et al [11] which shows that educational games have a significant effect on improving the fine motor skills of preschoolers. They also improve fine motor skills through activities that intensively involve hand-eye coordination.

The findings of this study not only reinforce the effectiveness of busy books in stimulating fine motor development but also demonstrate the potential for integrating cooperative play into the stimulation process. Unlike most previous studies, which used busy books individually, the Hand-In-Hand Book is designed for children to complete activities in pairs. This approach allows

children to gain motor stimulation as well as social experiences through interaction, communication, and cooperation with peers during the activity.

According to the researchers, the effectiveness of the Hand-In-Hand Book stems not only from the busy book activities that develop fine motor skills but also from the integration of cooperative play methods implemented during the intervention. Through cooperative play, children not only practice using the small muscles in their hands but also interact, collaborate, and help one another with their peers. These conditions increase children's engagement during the learning process, thereby optimizing the stimulation provided. The difference in gain scores between the intervention group and the control group indicates that greater improvements in fine motor development occurred in the group that received the Hand-In-Hand Book intervention compared to the control group.

The academic contribution of this study lies in the creation of the Hand-In-Hand Book. This is a stimulation tool that combines busy book activities with cooperative play. Previous studies mostly looked at books used by children on their own.. This study shows that mixing motor activities with social interaction leads to better outcomes. These results add knowledge to the research on child growth and development. They can also help guide the design of stimulation programs, for young children. Such programs could be used in schools and health care services.

Limitations of The Study

This study has limitations. First the number of participants was relatively small. Came from only two preschools in Bojonegoro Regency. This might make it hard to apply the results to a group. Importantly the program was mixed up with the school environment because each study group was assigned to only one school. Also the way people were assigned to groups was done at the school level and not at the level. This means it is hard to tell if the results were caused by the program or by differences between the schools. Differences at the start of the study in age and the people who take care of the children might have also played a role in the differences, between groups. In addition the group that did not get the program had lessons and was not matched with the other group in terms of how much attention or activity they had. Also the people who checked the results could not be kept from knowing which group each child was in. These issues make it harder to say for sure that the program caused the results.

I observed that the intervention lasted two weeks so the sustainability of the observed

improvement and its long-term effects remain unknown. I also noted that intervention fidelity was not formally quantified or reported, for example through a fidelity checklist or systematic monitoring of adherence to each intervention session. Therefore consistency in the implementation of the Hand-In-Hand Book activities cannot be fully evaluated. I found that the fine motor outcome was assessed using age-specific KPSP motor items. Because the number of items differed according to the child's age the possible score ranges were not equivalent, across age groups, which may limit comparison of raw scores. The bounded nature of the assessment scores may also have resulted in ceiling effects among children who already achieved the maximum score at baseline. In addition the KPSP fine motor items provide a screening-oriented assessment. Do not comprehensively capture all dimensions of fine motor ability.

Finally no a priori power calculation or formal sample size determination was conducted because the study included the accessible population. As a result the study may have had limited power to detect smaller differences. The precision of the estimated intervention effect should be interpreted with caution. Future studies should involve larger samples from multiple schools, use randomized allocation where feasible, include an attention-matched control condition, blind outcome assessors when possible, monitor and report intervention fidelity, use more comprehensive and age-comparable fine motor measures, and employ an a priori sample size calculation and effect-size estimation with confidence intervals. Longer follow-up periods are also recommended to evaluate the persistence of the observed effects.

CONCLUSION

This study observed a greater improvement in fine motor development among preschool children in the school receiving the Hand-In-Hand Book intervention compared with the control school over the two-week study period. The Hand-In-Hand Book combines manipulative fine motor activities with cooperative play, providing opportunities for children to practice hand-eye coordination through active and interactive learning experiences. However, because the intervention was implemented in only one school and the school setting was completely confounded with the intervention, differences between schools and the observed intervention-related differences cannot be separated. Therefore, the findings indicate an observed association between the Hand-In-Hand Book intervention and greater improvement in fine motor development in these two schools over two weeks, rather than definitive evidence of effectiveness or causality.

Further studies using randomized allocation, multiple schools or clusters per study arm, attention-matched control conditions, and validated outcome measures are needed to confirm the findings and determine the effectiveness of the Hand-In-Hand Book.

Based on the findings observed in the two preschool institutions during the two-week intervention period, the Hand-In-Hand Book may be considered as a potential stimulation activity for supporting fine motor development among preschool-aged children in similar educational settings. However, the findings do not provide sufficient evidence to recommend its broader implementation by parents or health professionals, or to establish its safety, adherence, or sustainability outside the school setting. We believe that the wider application of the Hand-In-Hand Book should be treated as a hypothesis for evaluation. Future studies must use samples involve multiple schools or clusters, per study arm extend follow-up periods and implement proper measures. Then can we determine whether the observed association can be replicated and whether the Hand-In-Hand Book intervention can be effectively implemented in different settings.

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AUTHOR'S CONTRIBUTION

The first author worked on creating the research idea gathering the data carrying out the intervention analyzing the data and writing the paper. The second author was in charge of supervising the research developing the methods understanding the results and checking and improving the paper. The third author helped with supervising the research improving the methods reviewing the paper and giving approval for it to be published. All the authors. Agreed to the final paper and are in charge of what is, in it.

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