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The Effect of Colored Sand Media on the Fine Motor Development of Children in Group B at TK YPPI Donggala

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A B S T R A C T

Understanding the development of children's fine motor skills through the use of colored sand media is crucial for teachers when providing stimuli to students. When learning with colored sand, children can enhance their imagination and exercise greater freedom in developing their physical fine motor skills. Utilizing colored sand media to develop fine motor skills in early childhood is a viable strategy, as it facilitates easier learning and practice for the children. The objective of this study was to determine the effect of colored sand media on children's fine motor development. This study employed a quantitative method with a descriptive experimental design. The subjects were 15 students from Group B at TK YPPI Donggala. Based on the results prior to the treatment, the data showed Very Well Developed (BSB) at 2.22%, Developed as Expected (BSH) at 11.11%, Starting to Develop (MB) at 55.56%, and Undeveloped (BB) at 31.11%. Conversely, the results after the treatment showed Very Well Developed (BSB) at 26.67%, Developed as Expected (BSH) at 53.33%, Starting to Develop (MB) at 20.00%, and Undeveloped (BB) at 0.00%. Data collection techniques included observation, interviews, and documentation. Data analysis was performed using percentage techniques and t-tests. The t-test results indicated a calculated t-value of 7.436 with a significance of 0.00. Since the significance value is less than 0.05, it is concluded that H0 is rejected and H1 is accepted. This indicates that the colored sand media method has a significant effect on the fine motor development of children in Group B at TK YPPI Donggala.

1. Introduction

According to the Law on Child Protection (Law of the Republic of Indonesia Number 32 of 2002), Chapter I, Article 1, a child is defined as someone who is not yet 18 years of age, including a child still in the womb. Meanwhile, according to the National Education System Law (UU Sisdiknas) No. 20 of 2003, Article 28,

Paragraph 1, the range of early childhood is 0-6 years, as illustrated in the statement: early childhood education is a coaching effort directed at children from birth up to the age of six, conducted through the provision of educational stimulation to assist physical and spiritual growth and development so that the child is prepared to enter further education (Sisdiknas, 2003). Furthermore, according to the Directorate of Early Childhood Education (PAUD), early childhood is defined as children in the age range of 0–6 years, whether served or not served by early childhood education institutions.

Learning media refers to anything used to transmit messages and stimulate the learning process in children. One medium that can stimulate children is colored sand. Playing with sand has been a favorite pastime for children from the past until the present. With its smooth texture, sand is capable of honing psychomotor, social, emotional, linguistic, sensory, and cognitive skills, allowing children to learn while playing. This aligns with Montessori (as cited in Sudono, 2009), who explains that through play, children will possess the ability to understand concepts and natural meanings without coercion.

Fine motor skills are skills involving small muscle groups for detailed activities, such as grasping, eating, writing, or using other objects. According to Fitriani, R., & Adawiyah, R., (2018), fine motor skills involve small muscles, requiring hand-eye coordination for activities such as drawing, writing, and cutting. Fine motor skills in 3-year-olds are more mature in terms of holding objects. Meanwhile, the fine motor capabilities of children aged 4-5 years include using a pencil, drawing, cutting with scissors, writing letters, and molding. According to Nurjannah, D. (2018), with the development of small muscles, children become capable of performing self-help skills. The fine motor capabilities of children aged 4-5 years include tying shoelaces, putting letters into envelopes, spreading jam on bread, forming various objects with clay, washing and drying their faces without wetting their clothes, and threading thread into a hole.It is observed that children whose fine motor skills do not develop optimally tend to have lower self-help skills compared to those with well-developed fine motor skills.

Fine motor skill development can be conducted using various media, such as pencil shavings collage (Pura, D. N., & Asnawati, 2019), mosaic media (Sukmawati, A., Rahman, T., & Giyartini, R., 2021), and puzzle media (Nurwita, S., 2019). This includes sand media, which children are already familiar with; however, this specific sand media has not yet been utilized in this context (Rachmawati, I., Amal, A., & Akib, A., 2022). Based on initial observations conducted by the researcher at Group B of TK YPPI Donggala (YPPI Donggala Kindergarten), several problems were identified. Most of the children's fine motor skills have not developed as expected. For instance, regarding hand strength and flexibility, children are unable to use writing instruments correctly and experience difficulty in coordinating hand and eye movements. This is caused by a lack of Educational Game Tools (APE), as well as inadequate facilities and infrastructure. Consequently, this impacts the level of child development, particularly in improving fine motor skills.

Understanding how to develop children's fine motor skills through the use of colored sand media is crucial for teachers in providing stimulation. When learning using colored sand, children can develop their imagination and are freer to develop their physical fine motor skills. Developing early childhood fine motor skills through colored sand media is one effort that can be made because it makes it easier for children to learn and practice fine motor skills. Teachers must also provide learning motivation that is enjoyable so that children are more interested and focused on the learning process. By utilizing colored sand media in learning, we can help children improve their fine motor skill development in a fun and creative way.

The objectives of this research are:
1. To describe the implementation of colored sand media in Group B of TK YPPI Donggala.
2. To determine the condition of fine motor skills among children in Group B of TK YPPI Donggala.
3. To analyze the effect of colored sand media on the fine motor skills of children in Group B of TK YPPI Donggala.

2. Methodology

The sample in this study was drawn from Group B, selected based on the research problem investigated. This group consisted of 15 children (7 girls and 8 boys) aged 5–6 years with fine motor development delays. The sampling technique employed was purposive sampling. The assessment instruments utilized included child observation sheets, assessment rubrics, interview guides, stationery, recording devices, and mobile phone cameras. Furthermore, the primary material used in this study was colored sand. The type of data collected was quantitative, obtained from observations during the learning process. This data described the children's fine motor skills before and after the treatment using colored sand media. The descriptive analysis was utilized to derive qualitative findings from the observation sheets, while the inferential analysis was employed to test the research hypothesis.

The collected data will be managed descriptively to derive qualitative interpretations from the observation sheets. The analysis technique employed to measure children's abilities involves classifying performance based on a developmental rubric using a four-point scale, where a score of 4, designated as Very Well Developed (BSB), is given when development significantly exceeds the teacher's expectations. A score of 3, categorized as Developing as Expected (BSH), is assigned when the child's development meets the criteria established within the assessment rubric. Conversely, a score of 2, categorized as Starting to Develop (MB), indicates the child is still in the process of development but has not yet fully met the minimum expectations, and a score of 1, Undeveloped (BB), is given when the child has not met the minimum expectations set by the teacher.

3. Results and Discussion

The initial observational data, collected prior to the intervention using colored sand media, revealed that the majority of the children were classified under the Starting to Develop (MB) category. These results are presented in several tables, according to three observed aspects: finger flexibility, sand molding accuracy, and sand molding speed. The comprehensive results detailing the children's abilities before and after the treatment are illustrated in Table 1.

Table 1. Recapitulation of Observation Results of Childres's Ability

Participants	Before Treatment						After Treatment					
	Finger Flexibility		Sand Molding Accuracy		Sand Molding Speed		Finger Flexibility		Sand Molding Accuracy		Sand Molding Speed	
	F	%	F	%	F	%	F	%	F	%	F	%
BSB	1	6,67	0	0,00	0	0,00	5	33,33	4	26,67	3	20,00
BSH	1	6,67	2	13,33	2	13,33	9	60,00	7	46,67	8	53,33
MB	8	53,33	10	66,67	7	46,67	1	6,67	4	26,67	4	26,67
BB	5	33,33	3	20,00	6	40,00	0	0,00	0	0,00	0	0,00

Based on Table 1, the results of the recapitulation of observations of children's abilities before and after being given colored sand media can be seen. From the aspect of finger flexibility, the BSB category increased from 6.67% to 33.33%, the BSH category increased from 6.67% to 60.00%, the MB category decreased from 53.33% to 6.67%, and the BB category decreased from 33.33% to 0.00%. In the second aspect, namely the accuracy of sand printing, the BSB category increased from 0.00% to 26.67%, the BSH category from 13.33% to 46.67%, the MB category decreased from 66.67% to 26.67%, and the BB category decreased from 20.00% to 0.00%. The last aspect, namely the sand printing speed, shows that the BSB category increased from 0.00% to 20.00%, the BSH category from 13.33% to 53.33%, the MB category decreased from 46.67% to 26.67%, and the BB category decreased from 40.00% to 0.00%. Therefore, it can be seen that there were significant changes in the development of children's abilities before and after implementing the colored sand media method. Observations made before and after the treatment showed that there were positive changes in the development of children's abilities. To ascertain whether the hypothesis is accepted or rejected, an analysis was conducted using the Paired Samples Test, as presented in Table 2.

Table 2. Paired Samples Test

	Paired Differences			95% Confidence interval of the Differences		t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Eror mean	Lower	Upper			
Pair 1 Before – After Perlakuan	-3.733	1.944	.502	-4.810	-2.657	-7.436	14	.000

Based on Table 2, the calculated t-value was -7.436 in the t-test, regardless of the plus or minus sign, so the value used was 7.448. Therefore, it can be concluded that H0 is rejected and H1 is accepted, meaning the colored sand media method has a significant effect on the fine motor development of children in Group B of TK YPPI Donggala. The comparison revealed a significance value of 0.00, which is less than 0.05. In accordance with the decision-making process in the paired samples test, this indicates that the colored sand media has a significant effect on the fine motor development of children in Group B of TK YPPI Donggala. Prior to the treatment, the results regarding the aspect of finger flexibility were predominantly categorized as Starting to Develop (MB) at 53.33%, followed by Undeveloped (BB) at 33.33%. However, after the treatment, the results indicated a shift, with the dominant category becoming Developed as Expected (BSH) at 60.00%, and Very Well Developed (BSB) at 33.33%.

Based on observations conducted after the treatment regarding motor development, the children were predominantly categorized as Developed as Expected (BSH). Children who were still in the Undeveloped category lacked sufficient finger flexibility. This was primarily due to a fear of getting dirty; consequently, the researcher and the teacher employed a gradual approach. This involved seating the hesitant child near peers who were engaged in playing with the colored sand, allowing the child to observe that their peers were safe, enjoying themselves, and that the activity did not soil their clothes. As a result, the children began to show interest and attempted to handle the colored sand. The progression to the Developed as Expected (BSH) category was evident as children became capable of pouring sand into molds to create 4 to 5 distinct shapes, such as fish, crabs, starfish, shells, and seahorses. The researcher selected sea animal shapes to align with the study's location, which is situated in a coastal environment, ensuring that these shapes were highly familiar to the children.

The first aspect investigated in this study was finger flexibility using colored sand media, aimed at enhancing children’s fine motor skills. This aligns with Sujiono, B., Sumantri, M. S., & Chandrawati, T., (2014), who states that the objectives of fine motor development are to cultivate children’s readiness and dexterity for writing, and to encourage the confidence required to complete tasks involving fine motor usage. The development of fine motor skills in kindergarten children is influenced by fine motor coordination, specifically relating to activities such as placing or grasping objects using the fingers. By the age of four, children’s fine motor coordination is highly developed, nearly reaching perfection (Suryana, 2016). However, the level of motor development varies among individuals.

Prior to the intervention, the aspect of molding accuracy was predominantly categorized as Starting to Develop (MB) at 66.67%, with the Undeveloped (BB) category at 20.00%. Following the treatment, the results shifted, with the dominant category becoming Developed as Expected (BSH) at 46.67%, and Very Well Developed (BSB) at 26.67%.

Based on observations conducted after the treatment regarding motor development, the children were more dominant in the Developed as Expected (BSH) category. Children who remained in the undeveloped category for molding accuracy were found to lack the necessary finger endurance to maintain pressure on the sand inside the mold, resulting in the collapse of the molded object. The emergence of the Developed as Expected (BSH) category demonstrates that children gained sufficient finger endurance, enabling them to successfully mold more than three shapes neatly and without destruction. This outcome is supported by Hidayah, N., & Rocmah, L. I. (2024), who state that improving skills like gripping and pinching in children aged 4–5 is vital for fine motor development, suggesting that suitable learning media like kinetic or magic sand should be utilized to stimulate these skills.

Septiana and Kartika (2024) suggest that sand is an effective alternative play medium that helps to foster creativity and fine motor development in children, noting that it is a highly beneficial activity. Specifically, sand play enhances children's visual ability, observational skills, precision and thoroughness (meticulousness), accuracy in designing structures, creativity, and contributes to the development of brain function in early childhood.

In the pre-intervention phase, the assessment of molding speed revealed that the majority of children were classified as Starting to Develop (MB) at 46.67%, and Undeveloped (BB) at 40.00%. Following the treatment, the results demonstrated a positive change, with the dominant category shifting to Developed as Expected (BSH) at 53.00%, and the Starting to Develop (MB) category at 26.67%. Based on the post-treatment observations of overall motor development, the children were predominantly classified under the Very Well Developed (BSB) category. The participants categorized as Undeveloped (BB) in molding speed were primarily unable to complete the sand molding task due to a lack of finger speed, resulting in them exceeding the stipulated time limit of three minutes. The subsequent emergence of the Developed as Expected (BSH) category is attributed to the children beginning to successfully finish the sand molding task within the three-minute duration

According to Sumantri (2005), the objectives for developing children's fine motor skills encompass several key areas: these include the ability to develop fine motor skills associated with the movement and coordination of both hands, and mobilizing body members connected to the fingers for tasks such as achieving readiness in molding objects. Furthermore, a primary goal is to coordinate the visual sense (eyes) with manual activities (hands), ensuring effective hand-eye coordination. Finally, development aims to enhance the capacity to control emotions while actively engaging in fine motor tasks.

The fine motor skills possessed by children vary, categorized as slow, fast, or age-appropriate, depending on the child's maturation. Development is considered slow if a child fails to acquire new skills expected for their age; categorized as fast if they acquire new developments earlier than expected; and considered age-appropriate when development aligns precisely with the child's age norms. However, children's

motor skills are not developed solely through maturation; their growth is also dependent upon providing direct stimulation and practice (Jannah, 2019). Based on the theoretical context and findings, it can be concluded that sand molding has a measurable influence on the fine motor skill development of children in Group B of TK YPPI Donggala, particularly in the aspects of flexibility, accuracy, and molding speed

4. Conclusion

The study conducted at TK YPPI Donggala involved 15 subjects from Group B. The objective of this study was to determine the effect of colored sand media on children's fine motor development, focusing on three observed aspects: finger flexibility, accuracy in sand molding, and speed in sand molding. Utilizing colored sand media is a learning activity that teachers can implement to foster children's fine motor skills. The learning process followed a structure of introductory, core, and closing activities. This study specifically focused on how colored sand can effectively train and enhance children's fine motor capabilities.

Prior to the activity, the researchers prepared the necessary materials, including colored sand, molds, and containers. The researchers guided the children during the colored sand activities, observing their progress and documenting the process. Observations were conducted in the second week to monitor children exposed to the media, followed by a subsequent assessment in the third week to evaluate the development of children who received the treatment. In conclusion, the use of colored sand in Group B at TK YPPI Donggala had a significant impact on children's fine motor skills. Through this medium, children were able to practice finger flexibility, accuracy, and speed in molding sand, as well as improve their concentration during the activity.

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