ETDC Indonesian Journal of Research and Educational Review
Volume 5, No. 1, 2025, pp 83 - 94

e–ISSN 2809-3682
p–ISSN 2809-7505

https://doi.org/10.51574/ijrer.v5i1.4002

Hands-On Activity on Fine Motor Skills in Early Childhood Education

Sintia[1], Sri Sufliati Romba[2], M. Yusran Rahmat[3]
[1, 2, 3] Universitas Muhammadiyah Makassar, Indonesia

Article Info

Article history:

Received September 25, 2025
Accepted November 25, 2025
Published December 27, 2025

Keywords:

Early Childhood;
Fine Motor Skills;
Hands-On Activities;
Meaningful Learning;
Pre-Experiment.

ABSTRACT

Fine motor skills are a crucial aspect of early childhood education, which is a prerequisite for learning readiness but often requires effective and applicable learning strategies. Therefore, this study aims to test and determine the magnitude of the effect of the implementation of hands-on activity (direct practice activities) on the fine motor development of early childhood children in Early Childhood Education SPAS. Al-Kautsar Bontobiraeng. This study is quantitative with a pre-experimental approach using a one-group pretest-posttest design. The research subjects consisted of 10 children in group B (aged 5–6 years). The main data collection technique was observation using a checklist sheet based on indicators of children's fine motor development. Data was analyzed using the non-parametric Wilcoxon Signed Rank Test due to sample limitations. The results of the study showed a significant increase in children's fine motor ability scores after the intervention. The average pretest score was 20.4, increasing to 32.4 in the posttest. The results of the statistical test showed an Asymp. Sig. value (2-tailed) of 0.000, which is less than 0.05 (0.000 < 0.05). This finding indicates that there is a significant influence of the implementation of hands-on activity on the fine motor development of early childhood. This study provides a practical contribution: hands-on activity is proven to be effective in stimulating and improving children's fine motor skills through direct, fun, and meaningful learning experiences. These results can be a recommendation for early childhood education teachers to adopt direct practice activities in fine motor development stimulation programs.

Corresponding Author:

Sintia,
Universitas Muhammadiyah Makassar, Indonesia
Email: iaatiaa13@gmail.com

1. INTRODUCTION

Early childhood education is a crucial foundation for a child's holistic development (Apriyansyah et al., 2024; Ginting, 2024). During the golden age, 0-6 years, cognitive, socio-emotional, language, and physical-motor development progress rapidly and influence each other. One aspect of physical-motor development that plays a vital role in a child's readiness to learn at the next level is fine motor skills (Amir et al., 2025; Priyantoro & Hasanah, 2023; Sherry & Draper, 2013).

Fine motor skills refer to the coordination between small muscles, especially in the hands and fingers, and the eyes (eye-hand coordination) (Bondi et al., 2022; Kamaruddin et al., 2023). This ability not only supports daily activities such as eating, dressing, and self-care but is also an absolute prerequisite for basic academic skills. Without adequate fine motor skills, children will face significant difficulties in holding a pencil correctly, cutting, pasting, and, ultimately, writing and drawing (Özkan & Kale, 2023; Sutapa et al., 2021; Zampella et al., 2021).

The development of fine motor skills in early childhood has broad dimensions of importance, namely: (1) Writing Readiness (Pre-Writing Skills): Skills such as gripping a crayon or pencil, wrist movement, and visual-motor coordination are direct precursors to writing ability (Chandler et al., 2021; Priyadi et al., 2024). Children who master fine motor skills will transition more smoothly to formal learning in elementary school. (2) Independence and Self-Help Skills: Fine motor activities are involved in personal tasks such as buttoning clothes, zippers, tying shoes, and using cutlery (Maryam et al., 2025). Mastery of these skills fosters a sense of self-confidence and independence in children. (3) Cognitive Development and Problem Solving: Fine motor activities often involve exploration, manipulation of objects, and simple problem solving, which indirectly stimulates children's cognitive development and spatial perception (Cortes et al., 2022; Martzog et al., 2019). (4) Emotional Well-Being: Successful completion of fine motor tasks, even simple ones, provides a positive sense of accomplishment (mastery), supports self-regulation, and improves focus and attention span (Józsa et al., 2023; Taverna et al., 2021).

Although the urgency of developing fine motor skills has been recognized in the Early Childhood Education curriculum, its practical implementation in the field still faces several challenges, namely: (1) Lack of Practical Resources: Many teachers and parents recognize the importance of fine motor skills but often lack references containing collections of practical (Alias et al., 2024; Scheiber et al., 2025), easily accessible, low-cost, and structured activities that can be directly integrated into daily learning activities. (2) Gap between Theory and Practice: The academic literature is rich in theoretical frameworks on the development of fine motor skills but lacks a bridge between these theories and step-by-step implementation guides that can be applied by educators without a specialized background in occupational therapy. (3) Too Narrow a Focus: Most activities implemented in the field still focus on classic activities such as coloring and cutting, despite the wide spectrum of play-based activities and recycled materials that are far more effective and engaging for children.

Previous research has largely examined the importance of fine motor skills from a diagnostic or evaluative perspective (Scheuer et al., 2019; Smits-Engelsman & Verbecque, 2022; Strooband et al., 2023; Watts & Pattnaik, 2023). However, there remains a gap in studies focusing on practical prescriptions—that is, providing a list of concrete, measurable, and locally resource-based (contextual) interventions that can be immediately implemented by Early childhood education stakeholders (teachers and parents).

Therefore, this article aims to fill this gap by offering a compilation and in-depth analysis of a variety of practical activities grounded in child development principles and pedagogical effectiveness.

2. METHOD

The type of research used was quantitative, with the aim of analyzing differences in scores before and after treatment (intervention). The research design used was a one-group pretest-posttest pre-experimental design. This design was chosen because it allowed researchers to compare the subjects' fine motor skills before treatment (O_1) and after treatment (O_2), without the need for a control group. Mathematically, this research design is represented as Figure 1.

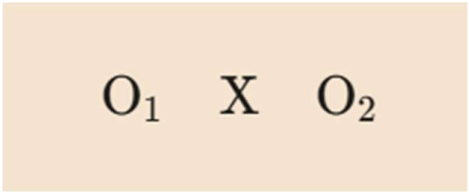

Figure 1. One Group Pretest-Posttest Pre-Experimental Design

Information:
O_1 : Pretest (Initial measurement)
X : Intervention (Implementation of the Practical Activity package)
O_2 : Posttest (Final measurement).

The study population was all children aged 5–6 years at PAUD SPAS Al-Kautsar Bontobiraeng. A total of 10 children aged 5–6 years from Group B at PAUD SPAS Al-Kautsar Bontobiraeng. Saturated Sampling (Census) or Purposive Sampling if the total number of children in Group B is 10. If the total number exceeds 10, purposive sampling was used with the following criteria: (1) Actively enrolled in Group B; (2) Permission from parents/guardians; (3) Having varying initial abilities (not just those who are very advanced or very poor). Research variables and operational definitions in Table 1.

Table 1. Research Variables and Operational Definitions

Variables	Operational Definition
Independent Variable (X): Practical Activities of fine motor skills	A series of low-cost, high-impact activities implemented in a structured manner (e.g., 12 sessions/4 weeks) aimed at developing eye-hand coordination, finger muscle strength, and precision. Activities include picking, tying, cutting, and squeezing.
Dependent Variable (Y): Fine Motor Skills	Quantitative scores obtained by children from observational assessments while performing specific fine motor skills tasks (such as

Variables	Operational Definition
	cutting straight lines/patterns, imitating basic shapes, and basic self-help skills) are measured using validated instruments.

The main instrument used to collect fine motor skills data in the Pretest and Posttest was the Fine Motor Skills Observation Sheet/Checklist.

1. Instrument Format: Uses a rating scale (1 = Not Yet Able, 4 = Very Able) to assess the level of mastery of aspects of fine motor skills.
2. Aspects Measured: Includes hand strength, bilateral skills, pincer grasp, visual-motor coordination, and tool manipulation (pencil, scissors).
3. Instrument Quality Test:
   - Validity: Content Validity is tested through expert judgment by at least two early childhood education experts or developmental psychologists.
   - Reliability: Inter-rater reliability is tested to ensure consistency of scores given by two or more trained observers.

This study is divided into three key phases:

Pre-Intervention Phase:

Pretest (O_1): Subjects (10 children) are initially measured for fine motor skills ability using an observation instrument. These scores are recorded as baseline data.

Intervention Phase (X):

- The intervention was implemented for 4 weeks (a total of 12 sessions) according to a predetermined schedule.
- Each practical activity session was guided by a researcher or a consistently trained teacher.
- The implementation of the activities was recorded in the Intervention Logbook to ensure treatment fidelity.

Post-Intervention Phase:

- Posttest (O_2): After all intervention sessions were completed, the same subjects' fine motor skills was measured again using the same instrument. This score was recorded as the final data.

Data analysis was conducted to compare the scores of O_1 and O_2 to prove the hypothesis of an increase in fine motor skills.

1. Descriptive Analysis: Conducted to present the data distribution, average (mean), and standard deviation of the pretest and posttest scores.
2. Prerequisite Tests:

- Normality Test: Using the Shapiro-Wilk test (because $N < 50$) on the difference (gain score) data between the posttest and pretest to determine whether the data is normally distributed.

3. Hypothesis Testing (Comparative):
- If the data is normally distributed (Parametric): Use the Paired Sample T-Test.
- If the data is not normally distributed (Non-Parametric): Use the Wilcoxon Signed-Rank Test.

Decisions are made based on the significance of value (p-value). If $p < \alpha$ (e.g., 0.05), there is a significant difference between the pretest and posttest, indicating that the fine motor skills practical activity intervention is effective.

3. RESULTS AND DISCUSSIO

Results

This section presents the research results, including observations and interviews conducted before and after the implementation of the hands-on activity method. The data were analyzed to determine changes in the level of fine motor development in early childhood.

Fine Motor Skills of Group B Students Before Hands-On Activity Method (Pre-test)

Based on the initial observation data, the percentage of Group B students before the method was implemented is shown in the following table 1.

Table 1. Pre-test Scores of Children's Fine Motor Skills

No	Child's Name	Observed Aspects												Total Score
		Eye and hand coordination				Use of simple tools				Pre-writing skills				
		1	2	3	4	1	2	3	4	1	2	3	4	
1.	A	2	2	1	2	2	1	2	2	1	2	2	1	20
2.	ANH	2	1	2	2	1	2	2	1	2	2	1	2	20
3.	FII	1	2	2	1	2	2	1	2	2	1	2	2	20
4.	KH	2	2	2	1	2	2	2	2	1	2	1	2	21
5.	MBA	2	2	2	2	2	2	2	2	2	2	2	2	24
6.	MN	1	2	1	2	1	2	2	1	2	1	2	1	18
7.	MRS	2	1	2	2	1	2	2	2	1	2	2	1	20
8.	MAT	1	2	2	1	2	2	1	2	2	1	2	2	20
9.	MF	2	2	2	2	2	1	2	2	1	2	2	2	22
10	QAM	1	2	1	2	1	2	2	1	2	1	2	2	19
		Total												**204**
		Average												**20,4**

The pre-test results showed that most children still had low fine motor skills. The highest pretest score was 24, and the lowest score was 18, with an overall average of 20.4. Based on the assessment criteria, this average indicates that children's fine motor

skills were still in the Undeveloped to Beginning to Develop category. These results indicate that before being given the hands-on activity method, children's fine motor skills were still moderate, with some participants showing relatively higher abilities, but overall, the students' fine motor skills were not evenly distributed. This finding serves as the basis for implementing the hands-on activity method to improve children's fine motor skills.

Fine Motor Skills of Group B Students After Hands-On Activity Method (Post-test)

The post-test results were obtained after using the hands-on activity method. Data on Group B students' results after treatment can be seen in the following table.:

Table 2. Post-Test Score Results

No	Child's Name	Observed Aspects												Total Score
		Eye and hand coordination				Use of simple tools				Pre-writing skills				
		1	2	3	4	1	2	3	4	1	2	3	4	
1.	A	3	3	2	3	3	2	3	3	2	3	3	2	32
2.	ANH	3	2	3	3	2	3	3	2	3	3	2	3	32
3.	FII	2	3	3	2	3	3	2	3	3	2	3	3	32
4.	KH	3	3	3	2	3	3	3	3	2	3	2	3	33
5.	MBA	3	3	3	3	3	3	3	3	3	3	3	3	36
6.	MN	2	3	2	3	2	3	3	2	3	2	3	2	30
7.	MRS	3	2	3	3	2	3	3	3	2	3	3	2	32
8.	MAT	2	3	3	2	3	3	2	3	3	2	3	3	32
9.	MF	3	3	3	3	3	3	3	3	2	3	3	3	34
10	QAM	2	3	2	3	2	3	3	2	3	2	3	3	31
		Total												**324**
		Average												**32,4**

After receiving hands-on activity treatment, post-test scores increased significantly. The highest score was 36, and the lowest was 30, with an overall average of 32.4. The 12-point increase in the average score indicates that the children's fine motor skills had improved to the "Developing as Expected" category, even approaching "Very Outstanding Development." This improvement indicates that the hands-on activity method had a positive impact on the development of children's fine motor skills, with almost all students experiencing an increase in scores compared to the pre-test. These results also demonstrate the effectiveness of the hands-on activity method in helping early childhood development.

Description of Pre-test and Post-test Results

The pre-test data will then be compared with the post-test scores to determine the difference between the pre-test and post-test scores. A checklist assessment was used to

assess student improvement. The increase in student scores following the hands-on activity method to improve fine motor skills is shown in the following Table 3.

Table 3. Pre-test and Post-test Result Data

No	Research Subjects	*Pre-test Score*	*Post-test Score*	Improvement Value Results
1.	A	20	32	12
2.	ANH	20	32	12
3.	FII	20	32	12
4.	KH	21	33	12
5	MBA	24	36	12
6.	MN	18	30	12
7.	MRS	20	32	12
8.	MAT	20	32	12
9.	MF	22	34	12
10.	QAM	19	31	12
Total		204	324	120
Average		20,4	32,4	120,0

Table 3 shows the results of data analysis obtained through pre-test and post-test observations. A significant improvement in the fine motor skills of early childhood children was observed after receiving treatment using the hands-on activity method. Observations were conducted on 10 children in Group B of PAUD SPAS Al-Kautsar Bontobiraeng. This change is evident in the increase in students' fine motor skill scores after participating in learning activities using the hands-on activity method. This indicates that the implementation of the hands-on activity method is effective in improving the fine motor skills of early childhood children.

Nonparametric Statistical Analysis Results

Data analysis in this study was conducted by comparing the results of children's fine motor skills before and after treatment. The non-parametric Wilcoxon Signed Rank Test was used to determine whether there was a significant difference between pre-test and post-test scores after the implementation of the hands-on activity method. The hypotheses used were that Ha states that there is an improvement in children's fine motor skills after treatment, while Ho states that there is no improvement in children's fine motor skills after treatment.

Table 4. Nonparametrik Test

Test Statistics[a]	
	Posttest-pretest
Z	-3.162[b]
Asymp. Sig. (2-tailed)	.002
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

The following are the results of hypothesis testing from the Wilcoxon Signed Rank Test using the IBM SPSS 25 program which can be seen in the following table.:

Table 5. Results of the Wilcoxon Signed Ranks Test

Ranks				
		N	**Mean Rank**	**Sum of Ranks**
Posttest-pretest	Negative Ranks	0[a]	.00	.00
	Positive Ranks	10[b]	5.50	55.00
	Ties	0[c]		
	Total	10		

a. posttest < pretest
b. *posttest > pretest*
c. *posttest = pretest*

The difference between the pre-test and post-test scores of the students can be seen in detail in Table 5. The data has also been tested using the Wilcoxon Signed Ranks Test statistical analysis, which shows that the average score of the students increased from 20.4 to 32.4 in the post-test after the implementation of the hands-on activity method. All children (10 participants) experienced an increase in scores, with none experiencing a decrease or remaining the same. The Z value of -3.162 with a significance of 0.00 (<0.05) indicates a significant difference in improving the fine motor skills of early childhood children at PAUD SPAS AL-Kautsar Bontobiraeng.

Discussion

This study aimed to determine the application of the hands-on activity method to improve fine motor skills in early childhood in Group B of PAUD SPAS Al-Kautsar Bontobiraeng. Based on data analysis using the Wilcoxon Signed Rank Test, the Asymp. Sig. (2-tailed) value was 0.001, which is lower than the significance level of 0.005. This outcome indicates a significant difference between the pretest and posttest results in children's fine motor skills before and after treatment. Therefore, we can conclude that the hands-on activity method implementation positively enhances fine motor skills in early childhood.

The average pretest score of 20.4 and posttest score of 32.4 demonstrate this improvement. These scores indicate that before treatment, children's fine motor skills were still in the "Developing as Expected" or below category. However, after treatment with hands-on activities, children's fine motor skills improved to "Very Well Developed". This improvement occurred because the hands-on activity method was able to create a fun learning environment.

Based on the previous data, the lowest pretest score was 18 and the highest score was 24. The children with the highest scores were those whose fine motor skills were beginning to develop (MB). Furthermore, based on the posttest results, there was an improvement after the treatment, with 10 study subjects showing optimal improvement.

Thus, the results of this study indicate that the implementation of the hands-on activity method has been proven to strengthen the fine motor skills of early childhood children at PAUD SPAS Al-Kautsar Bontobiraeng. This is evident in the increase in children's average score from 20.4 in the pretest to 32.4 in the posttest. Furthermore, statistical analysis using the Wilcoxon test also supported this finding with significant

results (Asymp. Sig. 0.002 < 0.05). The result means that hands-on activities not only make the learning process more enjoyable but also have a significant impact on developing hand-eye coordination, pre-writing skills, and the ability to use simple tools in children.

These findings confirm that hands-on activities are an effective learning strategy for optimizing the development of fine motor skills in early childhood (Bernal & Sholl-Franco, 2023; Hsiao et al., 2025; Maknun & Zulfahmi, 2025; Sandt, 2020). This finding aligns with the opinion of Ford et al. (2021) and Raynal et al. (2022), who emphasized the importance of teachers' role in providing guidance and support while early childhood engage in hands-on activities.

The results of this study are expected to make significant contributions, both theoretically in the development of educational science and practically in the implementation of learning in the field. This research strengthens motor development theory (such as maturational or dynamic systems theory) by providing specific empirical evidence that a hands-on approach is an effective catalyst for accelerating or improving the mastery of fine motor skills (such as grasping, picking, and eye-hand coordination) in children aged 4–5 years. This study presents a specific model or framework for how practical activities (e.g., stringing, tongs, play dough) can be systematically integrated into the Early Childhood Education curriculum, thus filling a gap in the literature, which often only discusses the general importance of fine motor skills without detailing proven intervention methods. Furthermore, this research can indirectly form the basis for the development of more sensitive and valid observation instruments or guidelines for measuring progress in specific fine motor skills, particularly those related to daily functional activities.

Furthermore, the results of this study provide practical and tested guidelines regarding effective types of activities, readily available tools and materials, and procedures for implementing practical activities to develop children's fine motor skills. Teachers can be more efficient in selecting and designing learning activities that are not only enjoyable but also have a significant impact on children's fine motor development, reducing time wasted on less effective activities. Encourage teachers to shift from passive teaching methods to more active, exploratory, and child-centered methods, in accordance with the principles of early childhood learning. The research results can be used as a scientific basis for revising and enriching sections of the curriculum related to fine motor development by emphasizing the allocation of time and resources for practical activities.

4. CONCLUSION

The hands-on activity method is effective in improving the fine motor skills of early childhood children in Group B (aged 5–6 years) at PAUD SPAS Al-Kautsar Bontobiraeng. The effectiveness is demonstrated by an increase in the average fine motor skill score of children from 20.4 in the pre-test to 32.4 in the post-test. Statistical testing using the Wilcoxon Signed Rank Test revealed an Asymp. Sig. (2-tailed) value of 0.002, which is less than 0.05, indicating a significant difference between the scores

before and after treatment. Sig. (2-tailed) value of 0.002 < 0.05, indicating a significant difference between before and after treatment. Consequently, the alternative hypothesis (Ha) is affirmed, and the null hypothesis (Ho) is dismissed. The findings of this study indicate that the incorporation of hands-on activities plays a crucial role in enhancing fine motor skills during early childhood, especially regarding hand-eye coordination, pre-writing abilities, and the utilization of basic tools.

As a recommendation, educators are advised to integrate fine motor activities (e.g., pinning, stringing, tearing) into daily learning themes, rather than simply making them separate sessions. This integration will make the activity more meaningful and less like a mere exercise. Longitudinal research is recommended to track the relationship between early childhood fine motor skill levels and academic readiness and performance (particularly writing and reading skills) as children enter elementary school. Furthermore, we recommend comparative studies that assess the effectiveness of different fine motor stimulation methods (e.g., Montessori-based, loose parts-based, and conventional methods) to identify the most optimal model.

REFERENCES

Alias, N. A., Kadar, M., Wan Yunus, F., & Cremin, K. (2024). An exploration of understanding teaching motor skills related to self-care skills among typical preschool children: parents' and teachers' perspectives. *Journal of Occupational Therapy, Schools, & Early Intervention*, *17*(2), 201-215. https://doi.org/10.1080/19411243.2023.2168825

Amir, M. K., Sinaga, T. S. W., Pakpahan, J. I., Pangaribuan, S. I., & Supriadi, A. (2025). Physical Motor Development of Early Childhood (Standards for the Level of Child Development Achievements) The Urgency of Gross Motor Development in Early Childhood Development. *Jurnal Pendidikan Jasmani (JPJ)*, *6*(1), 55-63. https://jurnal.stokbinaguna.ac.id/index.php/JPJ/article/view/4036

Apriyansyah, C., Tjalla, A., Saptono, A., Hartati, S., Jalal, F., Sukatmi, S., ... & Kurniawaty, L. (2024). Early childhood education: Integrative holistic early childhood development program implementation. *Child Education Journal*, *6*(2), 76-87. https://doi.org/10.33086/cej.v6i2.5990

Bernal, A. F., & Sholl-Franco, A. (2023). Sound and Movement hands-on workshop as a sensorimotor stimulation tool during child development. *Cuadernos de Educación y Desarrollo*, *15*(3), 2424-2444. https://ojs.europubpublications.com/ojs/index.php/ced/article/view/1195

Bondi, D., Robazza, C., Lange-Küttner, C., & Pietrangelo, T. (2022). Fine motor skills and motor control networking in developmental age. *American Journal of Human Biology*, *34*(8), e23758. https://doi.org/10.1002/ajhb.23758

Chandler, M. C., Gerde, H. K., Bowles, R. P., McRoy, K. Z., Pontifex, M. B., & Bingham, G. E. (2021). Self-regulation moderates the relationship between fine motor skills and writing in early childhood. *Early Childhood Research Quarterly*, *57*, 239-250. https://doi.org/10.1016/j.ecresq.2021.06.010

Cortes, R. A., Green, A. E., Barr, R. F., & Ryan, R. M. (2022). Fine motor skills during early childhood predict visuospatial deductive reasoning in adolescence. *Developmental psychology*, *58*(7), 1264. https://doi.org/10.1037/dev0001354

Ford, T. G., Kwon, K. A., & Tsotsoros, J. D. (2021). Early childhood distance learning in the US during the COVID pandemic: Challenges and opportunities. *Children and Youth Services Review*, *131*, 106297. https://doi.org/10.1016/j.childyouth.2021.106297

Ginting, T. G. (2024). Forming a Solid Foundation: The Role of Early Childhood Education in Character Development. *Solo Universal Journal of Islamic Education and Multiculturalism*, *2*(01), 71-82.

Hsiao, H. S., Chen, J. C., Chen, J. H., Chen, Y. X., & Chung, G. H. (2025). Incorporating the 6E Model Integrated with Creative Thinking Strategies into STEAM Education: Enhancing Children's Fine Motor Skills, Hands-on Performance, and Learning Behaviors. *Early Childhood Education Journal*, 1-22. https://doi.org/10.1007/s10643-025-01981-0

Józsa, K., Oo, T. Z., Borbélyová, D., & Zentai, G. (2023). Exploring the growth and predictors of fine motor skills in young children aged 4–8 years. *Education Sciences*, *13*(9), 939. https://doi.org/10.3390/educsci13090939

Kamaruddin, I., Dalail, W., Mahendika, D., Mulisi, A. S., & Rif'at, M. (2023). Developing Fine Motor Skills in Early Childhood through Plasticine Media. *Journal of Childhood Development*, *3*(2), 9-23.

Maknun, L., & Zulfahmi, M. N. (2025). Strategies for Developing Fine Motor Skills in Children Aged 5-6 Years Through Weaving Cassava Leaf Stalks: A Case Study at Tamrinussibyan Islamic Kindergarten. *Mitra Ash-Shibyan: Jurnal Pendidikan dan Konseling*, *8*(01), 47-60. https://doi.org/10.46963/mash.v8i01.2368

Martzog, P., Stoeger, H., & Suggate, S. (2019). Relations between preschool children's fine motor skills and general cognitive abilities. *Journal of Cognition and Development*, *20*(4), 443-465. https://doi.org/10.1080/15248372.2019.1607862

Maryam, N. H., Fairuzillah, M. N., & Khan, M. N. (2025). The Role Of Parents In Self-Help Skills For Physical Motor Development Of Children. *JP2KG AUD (Jurnal Pendidikan, Pengasuhan, Kesehatan dan Gizi Anak Usia Dini)*, *6*(01), 42-55.

Özkan, Z., & Kale, R. (2023). Investigation of the effects of physical education activities on motor skills and quality of life in children with intellectual disability. *International Journal of Developmental Disabilities*, *69*(4), 578-592. https://doi.org/10.1080/20473869.2021.1978267

Priyadi, A. T., Wati, I. D. P., Amir, A., Yuliana, Y. G. S., Khory, F. D., Sastaman, P., ... & Haetem, M. (2024). How are motor skills and writing readiness in children?: A literature review. *Retos: nuevas tendencias en educación física, deporte y recreación*, (61), 141-147.

Priyantoro, D. E., & Hasanah, U. (2023). Implementation of coloring activities early childhood in developing fine motor skills. *Journal of Childhood Development*, *3*(1), 1-12. https://journal.iaimnumetrolampung.ac.id/index.php/jcd/article/view/3139

Raynal, A., Lavigne, H., Goldstein, M., & Gutierrez, J. (2022). Starting with parents: Investigating a multi-generational, media-enhanced approach to support informal science learning for young children. *Early Childhood Education Journal*, *50*(5), 879-889. https://doi.org/10.1007/s10643-021-01209-x

Sandt, D. D. (2020). Effective implementation of animal assisted education interventions in the inclusive early childhood education classroom. *Early Childhood Education Journal*, *48*(1), 103-115. https://doi.org/10.1007/s10643-019-01000-z

Scheuer, C., Herrmann, C., & Bund, A. (2019). Motor tests for primary school aged children: A systematic review. *Journal of sports sciences*, *37*(10), 1097-1112. https://doi.org/10.1080/02640414.2018.1544535

Scheiber, B., Mildner, S., & Federolf, P. (2025). Parental and Educator Perceptions of Implementing Standardized Screenings for Early Detection of Motor Skills in Preschoolers: A Representative Survey. *Child: Care, Health and Development*, *51*(4), e70124. https://doi.org/10.1111/cch.70124

Sherry, K., & Draper, C. E. (2013). The relationship between gross motor skills and school readiness in early childhood: making the case in South Africa. *Early Child Development and Care*, *183*(9), 1293-1310. https://doi.org/10.1080/03004430.2012.721358

Smits-Engelsman, B., & Verbecque, E. (2022). Pediatric care for children with developmental coordination disorder, can we do better?. *Biomedical journal*, *45*(2), 250-264. https://doi.org/10.1016/j.bj.2021.08.008

Strooband, K. F., Howard, S. J., Okely, A. D., Neilsen-Hewett, C., & de Rosnay, M. (2023). Validity and reliability of a fine motor assessment for preschool children. *Early Childhood Education Journal*, *51*(5), 801-810. https://doi.org/10.1007/s10643-022-01336-z

Sutapa, P., Pratama, K. W., Rosly, M. M., Ali, S. K. S., & Karakauki, M. (2021). Improving motor skills in early childhood through goal-oriented play activity. *Children*, *8*(11), 994.

Taverna, L., Bellavere, M., Tremolada, M., Santinelli, L., Rudelli, N., Mainardi, M., ... & Tosetto, B. (2021). Oncological children and well-being: Occupational performance and HRQOL change after fine motor skills stimulation activities. *Pediatric reports*, *13*(3), 383-400. https://doi.org/10.3390/pediatric13030046

Watts, R., & Pattnaik, J. (2023). Perspectives of parents and teachers on the impact of the COVID-19 pandemic on children's socio-emotional well-being. *Early Childhood Education Journal*, *51*(8), 1541-1552. https://doi.org/10.1007/s10643-022-01405-3

Zampella, C. J., Wang, L. A., Haley, M., Hutchinson, A. G., & de Marchena, A. (2021). Motor skill differences in autism spectrum disorder: A clinically focused review. *Current psychiatry reports*, *23*(10), 64. https://doi.org/10.1007/s11920-021-01280-6