

## Fine Motor Development in Improving the Writing Ability of Autistic Children in Primary School, Age 9 Years old

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### Abstract

Writing skills are an important aspect of children's academic development, including those with disability such as children with autism spectrum disorder (ASD). This research analyzes the effects of fine motor development on children with autism's writing ability, identifies the factors, and designs effective, applicable interventions. This research uses a descriptive qualitative approach with a single case study method. The study population consisted of 9-year-old children diagnosed with ASD at High Five Preschool Academy. The sample consisted of 10 children, selected through purposive sampling. The research subject was a 9-year-old boy who was diagnosed with autism and had writing barriers. The writing results were analyzed descriptively to evaluate neatness, letter-shape accuracy, and consistency over time. This technique was chosen because it can describe the in-depth meaning of the subject's experiences and responses during the learning process. This finding strengthens the results of previous research. It adds new insights into the effectiveness of individualized learning programs (IOPs) designed in a structured, multisensory, and collaborative manner among teachers, parents, and experts. In conclusion, fine motor development significantly improves children with autism writing skills.

### Keywords

Autism; Fine Motor; Individualized Learning program; Intervention; Multisensory

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## 1. INTRODUCTION

Writing is one of the language skills that plays an important part in supporting children's academic, social, and emotional development (Lin et al., 2024). Through writing activities, children can express ideas, communicate in writing, and build connections with their learning environment. However, for children with special needs, especially children with autism spectrum disorder (ASD), writing skills often become a serious challenge (Suggate, Karle, & Kipfelsberger, 2023). They often experience difficulties coordinating fine hand movements, maintaining attention, and processing visual information optimally (Ling & Ahmad, 2021; Almadani et al., 2022). Tarigan (2018) explains that writing is a complex communication process that requires simultaneous integration of cognitive, linguistic, and motor skills. This skill is strongly influenced by children's physical and mental readiness, including fine motor skills that underlie grasping the writing instrument, regulating hand pressure, and controlling fine movements in a sustained manner (Baixauli, Rosello, Berenguer, & Miranda, 2021). In autistic



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children, various studies have shown that weakness in fine motor skills is a dominant factor in the slow development of writing skills (Puspita & Hartati, 2021; Setiawan, Pusponegoro, & Ramdhani, 2020).

Several studies have identified a significant relationship between fine motor skills and writing skills in children with special needs. (Anis et al., 2022) revealed that hand-eye coordination directly contributes to the clarity and neatness of children's writing. Research by (Widyana & Sugiasih, 2025) also shows that activities such as putting together puzzles or tracing can strengthen movement coordination and academic skills, including writing. In addition, multisensory approaches in learning for children with autism are effective in improving understanding of graphic symbols and motor control (Rosenblum, 2019; Ch & Ahmad, 2021). However, there is still a gap in research on structured and effective intervention models to improve writing skills based on fine motor strengthening in children with autism (Manizheh & Saberi, 2025). Most studies tend to focus on cognitive and linguistic aspects, while approaches that target motor aspects are still less explored in depth (Muthusamy et al., 2021; Ali et al., 2024). On the other hand, short-term studies with an individualized learning program (IOP) design based on fine motor activities can be an efficient alternative and have a real impact on children's writing development (Suharti, Andry, Sukova, & Riana, 2023).

This research aimed to answer the main question: how does the development of fine motor skills affect the writing ability of children with autism? The specific objectives of this study were to identify influencing factors, assess the effectiveness of the intervention, and design PPI based on fine motor activities and a multisensory approach (Ling & Ahmad, 2023). Writing skills are not only important in supporting children's communication, but also play a role in building self-confidence and increasing their independence in interacting with the surrounding environment (Ilmiyah & Suparno, 2025; Marie et al., 2024). By filling the gaps of previous research, this study is expected to create a real collaboration in the development of learning strategies that are more inclusive and responsive to the needs of children with autism (Ehsan, 2024). The findings of this study are also expected to serve as a practical reference for teachers, therapists, and parents in designing interventions that are measurable, applicable, and aligned with children's developmental characteristics.

To better understand the relationship between fine motor development and writing skills in children with autism, it is important to examine the theoretical foundations linking motor control, sensory processing, and academic performance. Writing is not merely a linguistic task; it is a multidimensional activity that requires integrating neuromuscular coordination, perceptual abilities, executive functioning, and sustained attention. In children with autism, differences in neurological processing often influence how sensory information is received, organized, and translated into motor responses. These differences may affect posture stability, bilateral coordination, finger isolation, and grip strength, all of which are fundamental components of handwriting performance.

Fine motor skills involve the coordination of small muscles in the hands and fingers in harmony with visual input. This coordination enables children to manipulate objects precisely, control writing tools, and form letters accurately. When fine motor control is weak, children may demonstrate inconsistent letter formation, irregular spacing, excessive or insufficient pencil pressure, and fatigue during writing tasks. Such difficulties can lead to frustration, avoidance behaviors, and reduced motivation to engage in academic activities. Therefore, strengthening fine motor skills is an essential entry point for supporting writing development in children with autism.

From a developmental perspective, motor skill acquisition follows a gradual and hierarchical pattern. Children first develop proximal stability, including trunk and shoulder control, before refining distal movements such as finger manipulation. If foundational motor stability is not adequately developed, higher-level tasks such as handwriting may become inefficient and effortful. For children with autism, delays in gross motor coordination or sensory integration may indirectly impact fine motor precision. Consequently, intervention programs should consider a comprehensive motor approach that includes posture alignment, upper body strengthening, and hand dexterity exercises.

In addition to motor factors, sensory processing plays a crucial role in writing performance. Many children with autism experience either hypersensitivity or hyposensitivity to tactile, proprioceptive, or visual stimuli. Tactile defensiveness may cause discomfort when holding writing tools, while proprioceptive difficulties may lead to poor regulation of hand pressure. Visual processing challenges may affect letter alignment and spatial organization on paper. A multisensory approach addresses these challenges by incorporating tactile, auditory, kinesthetic, and visual elements into instruction. For example, children may trace letters using textured materials, form shapes with clay, or practice writing in sand before transitioning to paper-based tasks. Such strategies enhance sensory feedback and reinforce motor memory.

Furthermore, attention regulation is closely linked to writing performance. Writing requires sustained focus, working memory, and task persistence. Children with autism may exhibit fluctuating attention, repetitive behaviors, or difficulty shifting between tasks. When fine motor tasks are too demanding, cognitive resources may be overwhelmed, reducing the child's ability to concentrate on content generation. By strengthening automaticity in motor execution, children can allocate more cognitive energy to organizing ideas and constructing sentences. Thus, improving fine motor efficiency may indirectly enhance higher-order writing skills.

Individualized Educational Programs (IEP or PPI) provide an appropriate framework for implementing structured fine motor interventions. Through systematic assessment, educators can identify specific motor weaknesses, such as poor grasp patterns, limited finger dissociation, or slow writing speed. Based on these findings, measurable goals can be formulated, for instance, increasing writing endurance from five to ten minutes, improving letter legibility accuracy, or enhancing hand-eye coordination through targeted exercises. Regular monitoring and data collection enable teachers and therapists to evaluate progress and adjust intervention strategies accordingly, objectively.

An effective fine motor-based writing intervention may consist of several structured phases. The first phase involves motor readiness activities, such as hand-strengthening exercises with therapy putty, clothespin squeezing, or bead threading. The second phase focuses on pre-writing skills, including tracing lines, copying shapes, and practicing directional strokes. The third phase gradually introduces letter formation, beginning with simple vertical and horizontal strokes before progressing to curves and diagonal lines. Throughout these stages, multisensory reinforcement and positive feedback are essential to maintain engagement and motivation.

Collaboration among teachers, occupational therapists, and parents is another critical component of successful intervention. Writing practice should not be limited to classroom sessions; consistency across environments supports skill generalization. Parents can provide simple home-based activities, such as coloring, cutting with scissors, or assembling small construction toys, to reinforce fine motor strength. Clear communication between professionals ensures that strategies are aligned and adapted to the child's evolving needs.

Moreover, cultural and contextual factors should be considered when designing interventions. Educational settings vary in terms of class size, resource availability, and teacher training. In inclusive classrooms, teachers may need practical and time-efficient strategies that can be integrated into daily routines. Therefore, intervention models should be realistic, adaptable, and sustainable. Short-term structured programs with clear procedural guidelines may offer a feasible solution in schools with limited resources.

Evaluating the effectiveness of fine motor interventions requires reliable and valid assessment tools. Measurement indicators may include handwriting legibility scales, writing speed analysis, grip assessment, and observational checklists of motor behavior. Pre- and post-intervention comparisons provide evidence of progress, while qualitative feedback from teachers and parents offers additional insight into functional improvements. Beyond technical handwriting accuracy, evaluation should also consider changes in confidence, task engagement, and independence.

The broader implications of this research extend beyond academic achievement. Writing competence contributes to self-expression and social participation. When children with autism can communicate their thoughts clearly in writing, they gain greater opportunities for inclusion in academic and social contexts. Improved writing ability may reduce reliance on adult assistance, fostering autonomy and self-esteem. In the long term, foundational writing skills support higher educational attainment and vocational readiness.

In conclusion, the development of fine motor skills represents a critical factor in enhancing writing ability among children with autism. By integrating motor strengthening, sensory-based strategies, and individualized planning, educators can create supportive learning environments that address both functional and emotional aspects of writing. A structured, evidence-based intervention model has the potential to bridge existing research gaps and provide practical guidance for inclusive education practices. Through systematic implementation and collaborative effort, fine-motor-focused programs can significantly improve children with autism's academic experiences and overall quality of life.

## 2. METHODS

This study used a descriptive, qualitative approach with a single-case study design. This approach was chosen to describe in depth the influence of fine motor skill development on the writing ability of children with autism spectrum disorder (ASD). The qualitative approach provides space for researchers to understand the dynamics of the subject contextually, while the case study allows detailed exploration of the intervention (Wulandari et al., 2025). The study population consisted of 9-year-old children diagnosed with ASD at High Five Preschool Academy. The sample consisted of 10 children, selected through purposive sampling with the following criteria: (1) aged 8 years, (2) having an official diagnosis of ASD based on DSM-5 [1], (3) showing difficulty focusing attention based on teacher reports, and (4) obtaining parental consent. This sample is considered representative of the study's context despite its limited size.

The subject in this study was a nine-year-old boy who had been diagnosed with autism and showed significant impairments in fine motor skills and writing ability. The subject was purposively selected based on certain criteria: difficulty copying letters, limited hand-eye coordination, and already recognizing basic letters. The purposive sampling technique was chosen to ensure that the subjects aligned with the research focus (Sugiyono, 2019).

Data collection in this study was carried out using several instruments, namely structured observation sheets to record subject behavior during the intervention process, fine motor skills checklists to evaluate progress in activities such as holding stationery and following patterns, documentation of writing results as material for analyzing the development of writing skills over time, and semi-structured interviews with parents and teachers to obtain background information and responses to the intervention. Data were collected through structured observation using an observation sheet based on a Likert scale (1–3: unable, able with assistance, able without assistance). This instrument measured five indicators of attention focus: (1) attention span (time spent focusing on a task), (2) response to verbal instructions, (3) response to nonverbal instructions, (4) resistance to distraction, and (5) active engagement in activities. The instrument's validity was assessed through content validity by two special education experts, and reliability was assessed using the Cronbach's Alpha coefficient, yielding a value of 0.85, indicating high reliability. The intervention lasted 8 weeks, with 30-minute sessions 3 times per week. Each session included three types of activities: (1) tactile games (10 minutes), (2) balance exercises (10 minutes), and (3) vestibular stimulation (10 minutes). The activities were designed based on the principles of sensory integration [2] and tailored to the individual needs of the children based on initial observations. Data validity was strengthened through source and technique triangulation (Anjani et al., 2025; Rodia & Mawardah, 2024).

The research procedure was carried out through four stages. The first stage was preparation, which included an initial assessment of the subject's condition, planning an individualized learning program (IAP), and preparing data collection instruments. The second stage was the implementation of the intervention, which was carried out over four sessions over one week, each lasting 45 minutes. Activities carried out include training in grasping stationery, tracing lines, arranging puzzles, and copying simple letters or words. The third stage is monitoring and data collection, which is carried out during the intervention, using direct observation, documentation of writing results, and follow-up interviews to record changes. The fourth stage is evaluation, which involves analyzing all qualitative data to assess the intervention's effectiveness in improving the subject's fine motor and writing skills. The collected data were analyzed using thematic analysis techniques. Data from observations and interviews were compiled into a narrative and categorized into main themes relevant to the research focus. Meanwhile, the writing results were analyzed descriptively to evaluate neatness, letter-shape accuracy, and consistency over time. This technique was chosen because it can describe the in-depth meaning of the subject's experiences and responses during the learning process (Braun & Clarke, 2019). The approaches and procedures used in this study are expected to provide a comprehensive picture of the effectiveness of fine motor activity-based interventions in supporting the development of writing skills in children with autism, both overall and in context.

### 3. FINDINGS AND DISCUSSIONS

#### Findings

This study was conducted across 4 intervention sessions over 1 week to evaluate the effect of fine motor skill development on the writing ability of children with autism spectrum disorder (ASD). The intervention process was structured and included a series of fine-motor practice-based activities, such as squeezing balls, tracing lines, putting together puzzles, and copying letters and simple words. Data were obtained through direct observation, motor skills checklist, documentation of writing results, and semi-structured interviews.

Table 1. Development of Fine Motor Skills and Writing

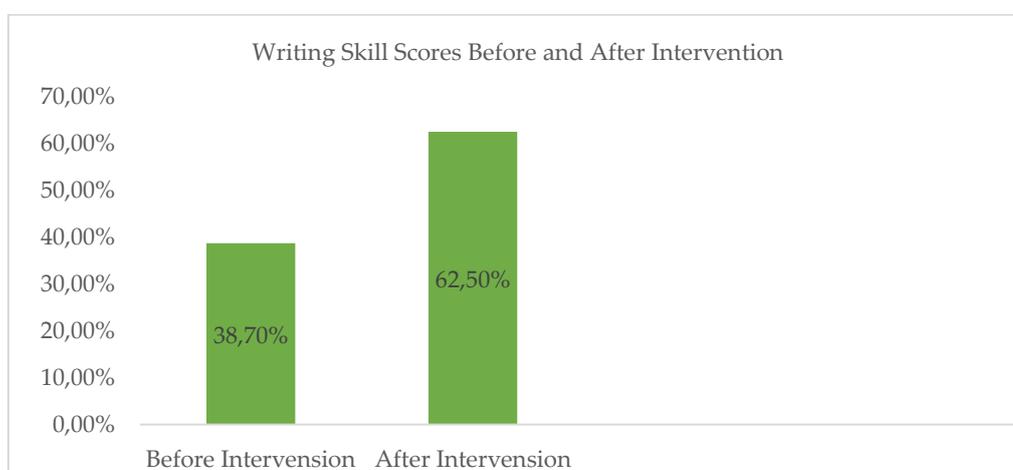
No.	Activities	Initial Condition	Condition After Intervention
1	Squeezing balls and putting together puzzles	Hand-eye coordination is not good.	Starting to hold the tool stably.
2	Tracing the dotted line	The line results are sloppy and inconsistent.	The lines are neater, although there are still deviations.
3	Copying simple letters	Difficulty recognizing and copying letters.	Started to copy the letters A, O, and I neatly.
4	Copying simple words	Difficulty forming letters into simple words.	Can copy the word "clothes" with the help of tracing.

Table 1 above illustrates the development of children's fine motor and writing skills before and after intervention. Initially, children showed difficulties with hand-eye coordination, control of writing instruments, and letter and word copying. For example, when performing activities such as squeezing a ball and putting together puzzles, children's hand-eye coordination remained poor, leading to unstable movements. However, after the intervention, the children began to be able to hold tools more firmly and steadily (Hasana, Psikologi, Humaniora, & Darma, 2023).

In the tracing activity, the children's lines initially appeared messy and inconsistent. After being given practice, the children began to be able to trace more neatly, although there were still slight deviations (Bariyyah, 2018). This shows an improvement in hand control over writing instruments

(Indalestari & Wahyuningrum, 2021). The ability to copy simple letters also improved. Before the intervention, the child had difficulty recognizing and copying letters correctly. After several practice sessions, the child was able to copy letters such as A, O, and I more neatly and consistently. This improvement laid the foundation for the next stage of development, which is copying words (Assjari & Sopariah, n.d; Qudwatullathifah et al., 2024).

At the stage of copying simple words, children initially had difficulty combining letters into words. After the intervention, children were able to copy words such as "clothes" with the help of guidelines or tracing (Fadilah et al., 2023). Although they still needed support, this ability showed that children were beginning to understand the shape of letters and how to arrange them into words (Baharudin, Sifaq, Olahraga, & Surabaya, 2014). Overall, this table shows that fine motor intervention positively impacts children's writing skills. Children not only experience improvements in physical aspects such as grip strength and hand-eye coordination, but also in cognitive abilities to recognize, form, and copy letters and simple words (Rachmayani et al., 2025; Wulandari et al., 2025).



**Figure 1.** Writing Skill Scores Before and After Intervention

(Initial score: 38.7%, increased to 62.5% at the end of the session)

Based on Figure 1 shows a comparison of children's writing scores before and after the intervention. At the beginning of the activity, the children's writing scores were at 38.7%. This figure shows that the children's writing skills remained relatively low in letter accuracy, neatness, and the ability to follow writing instructions. After receiving an intervention focused on fine motor skills and writing exercises, there was a significant improvement. The children's writing ability score increased to 62.5%. This improvement shows that the children were able to write more neatly, hold writing instruments more steadily, and copy letters and words more accurately than at the beginning. Overall, this graph shows that the intervention provided had a positive impact on the children's writing skills. The increase from 38.7% to 62.5% demonstrates that fine-motor skills exercises improve children's ability to control hand movements and enhance their writing outcomes.

## Discussion

The results showed a significant improvement in the subject's writing skills. Initially, the subject had difficulty holding the writing utensil steadily; the writing results were not neat, and the letters were not copied correctly. After the intervention, the subject showed improvement in hand-eye coordination, more consistent line tracing ability, and success in copying the letters A, O, and I correctly. In fact, by the final session, the subject was able to copy simple words such as "shirt" with visual assistance. The writing skill score also increased from 38.7% to 62.5%, indicating a significant improvement. This change supports the findings of Larasati et al. (2024), who stated that fine motor skills are instrumental for writing clarity, stationery control, and the efficiency of writing movements. In addition, the

multisensory approach used in this study aligns with constructivist principles, which hold that children learn more effectively through sensory involvement in real activities (Zahra et al., 2025; Sidiq et al., 2025).

This research is also in line with the study of (Perwanida & Nata, 2025) which emphasizes the importance of visual-motor coordination training in supporting children's academic achievement. Activities such as putting together puzzles and tracing lines are forms of fine motor training that have proven effective in supporting writing skills (Virianingsih, Tegeh, & Ujjanti, 2021). Research also states that kinesthetic activities, such as tracing and copying visual symbols, can strengthen the basics of literacy skills for children with special needs. The *novelty* of this study lies in the application of an individualized learning program (IOP) focused on fine motor strengthening in a short-term, systematic format. Although implemented in only four sessions, the results showed a marked improvement in the technical and psychological aspects of writing for children with autism. This indicates that simple, inexpensive, and applicable strategies can be effectively implemented in inclusive primary schools. In terms of practical implementation, the findings confirm the need for a collaborative approach among teachers, parents, and therapists to support the development of autistic children's writing skills. Intervention programs should not only focus on academic aspects, but also consider the motor and emotional dimensions that form the basis of children's overall learning readiness (Khotimah, n.d; Lebang & Pasa, 2021). Thus, fine motor strengthening should be prioritized in educational interventions for children with autism, as it directly impacts basic academic skills and enhances self-confidence and social participation.

The results of this study are consistent with sensory integration theory, which states that structured sensory stimulation can improve neurological organization in children with ASD (Ayres, 2005). Activities such as tactile play and balance exercises help children regulate their sensory responses, improving their readiness to learn in the classroom (Syaikh et al., 2019). That sensory integration supports children's participation in academic and social activities, as evidenced by increased active engagement in this study (Asti, 2023). Tactile play, such as sand play, is most effective at increasing attention span, possibly because it provides calming sensory stimulation (R. S. Ilmiyah et al., 2024).

Improved responses to verbal and nonverbal instructions indicate that sensory-motor activities help children with ASD process multisensory information more effectively. This aligns with Baranek's (2006) findings, which indicate that sensory interventions can reduce sensory processing disorders. The decrease in distraction frequency also indicates that this intervention helps children overcome hypersensitivity to environmental stimuli, such as sounds or movements in the classroom (Ritonga et al., 2025).

However, this study has limitations, including a small sample size and focus on a single institution (High Five Preschool Academy). Generalizing the findings to other educational settings requires further research with larger and more diverse samples. In addition, the effectiveness of sensory motor activities may vary depending on the individual sensory needs of the child, as suggested by (Wahid, Usman, & Rahman, 2025). Educators need to be trained to tailor these activities to each child's sensory profile.

This study also highlights the importance of collaboration among educators, occupational therapists, and parents in implementing sensory-motor learning. This approach can be integrated into daily classroom routines, such as structured playtime or exercise sessions, to support the development of children with ASD (Kurniawati et al., 2024; Phandinata, Atmodiwirjo, & Basaria, 2017).

Beyond the immediate outcomes observed in this study, it is important to consider the broader pedagogical implications of structured fine motor and sensory-motor interventions in inclusive educational contexts. Writing development in children with autism should not be viewed as an isolated academic goal, but rather as part of a holistic developmental process that integrates motor, cognitive, emotional, and social domains. When fine motor strengthening is systematically embedded into classroom instruction, it not only enhances technical handwriting performance but also supports overall

school readiness and adaptive functioning.

One important aspect that emerged from the intervention process is the role of repetition and structured routines. Children with autism often benefit from predictable learning sequences and clearly defined task expectations. The structured four-session format implemented in this study provided consistent activity patterns, allowing the child to anticipate tasks and gradually build mastery. Repetition of tracing, copying, and tactile-based exercises contributed to motor memory consolidation. Over time, repeated exposure to similar motor patterns facilitated smoother and more automatic writing movements. This supports the idea that consistency and structured scaffolding are essential components of effective intervention for children with ASD.

Another key factor is the emotional dimension of writing development. Initially, the subject displayed signs of hesitation and low confidence when asked to complete writing tasks. As motor control improved, observable changes in emotional responses were noted, including increased willingness to attempt new tasks and reduced avoidance behavior. This suggests that motor competence and emotional regulation are closely interconnected. When children experience success in structured motor activities, their self-efficacy increases, which in turn positively influences their engagement in academic learning. Therefore, interventions targeting fine motor skills may indirectly promote psychological resilience and intrinsic motivation.

The short duration of the intervention also provides valuable insight into the potential efficiency of targeted programs. While long-term therapy is often recommended for children with autism, this study demonstrates that even brief, focused interventions can yield measurable improvements when carefully designed. The key lies in clarity of objectives, individualized adaptation, and systematic evaluation. This finding is particularly relevant for schools with limited resources, where extended therapy sessions may not always be feasible. By incorporating short but intensive motor-based modules into regular classroom schedules, educators can maximize learning outcomes without requiring extensive additional funding.

Furthermore, integrating multisensory strategies into the intervention underscores the importance of experiential learning. Children with autism frequently demonstrate strengths in visual processing and concrete learning experiences. By combining tactile, visual, and kinesthetic inputs, the intervention leveraged multiple sensory channels to reinforce learning. For example, tracing letters in sand provided tactile feedback, while visual modeling supported correct letter formation. This layered sensory stimulation enhanced neural connectivity related to motor planning and execution. The effectiveness of such strategies highlights the need for flexible instructional approaches that move beyond traditional pencil-and-paper tasks.

It is also essential to address the role of teacher competence and professional development in implementing similar programs. Teachers in inclusive settings must possess foundational knowledge of sensory processing, fine motor development, and individualized instruction techniques. Without adequate training, well-designed intervention strategies may not be executed effectively. Professional development workshops focused on practical motor activities, classroom adaptations, and progress-monitoring techniques could strengthen teachers' capacity to support students with ASD. In this regard, collaboration with occupational therapists can serve as a valuable resource for building teacher expertise.

Family involvement further strengthens intervention outcomes. When parents are informed about the objectives and methods of fine motor training, they can reinforce similar activities at home. Simple household materials such as playdough, clothespins, rice trays, or coloring books can be utilized to maintain continuity of practice. Consistent reinforcement across home and school environments promotes skill generalization, ensuring that improvements are not limited to structured sessions only. Additionally, parental engagement fosters shared responsibility and creates a supportive ecosystem for the child's development.

From a research perspective, the findings of this study open avenues for future investigation. Subsequent research could examine the longitudinal effects of fine-motor-based interventions to determine whether improvements in early handwriting skills translate into enhanced composition abilities and academic achievement in later grades. Comparative studies examining different sensory-motor strategies may also identify which techniques yield the greatest impact for specific sensory profiles. Moreover, integrating quantitative measurements with qualitative observations could provide a richer understanding of how children experience and internalize motor-based learning processes.

Another potential direction for future research involves the use of assistive technology in conjunction with fine motor interventions. Digital tracing applications, adaptive pencil grips, and tablet-based writing programs may complement traditional sensory activities. However, it is important to ensure that technology does not replace hands-on motor practice entirely, as tactile and proprioceptive feedback remain crucial for motor development. Balanced integration of technology and physical activity may provide optimal outcomes.

Ethical considerations must also be acknowledged when conducting interventions with children with autism. Respect for individual differences, sensitivity to sensory preferences, and avoidance of overstimulation are essential. Interventions should be child-centered and responsive, rather than rigidly standardized. Continuous observation of the child's comfort level and engagement ensures that activities remain supportive rather than overwhelming. Ethical practice also includes transparent communication with parents and caregivers regarding goals, procedures, and progress.

In terms of educational policy, the study reinforces the importance of allocating time within the curriculum for motor readiness activities. Academic instruction in the early grades often prioritizes literacy and numeracy outcomes while paying insufficient attention to foundational motor skills. However, as demonstrated by the results, motor readiness significantly influences literacy acquisition. Policymakers and school administrators should consider integrating structured motor development modules into early childhood and primary education frameworks, particularly within inclusive schools serving children with diverse learning needs.

Overall, the additional findings strengthen the argument that fine motor development is not merely a supplementary skill, but a foundational component of writing proficiency in children with autism. The measurable increase in writing scores, improvement in coordination, and enhanced responsiveness to instruction collectively demonstrate the multifaceted benefits of sensory-motor-based learning. By combining structured practice, multisensory engagement, collaborative support, and individualized planning, educators can create sustainable pathways to improve literacy outcomes for children with ASD.

In conclusion, expanding intervention efforts beyond isolated writing drills toward comprehensive motor-based programs offers promising potential for inclusive education. The evidence presented suggests that targeted fine motor strengthening can produce meaningful academic and psychological gains within a relatively short timeframe. With continued research, professional collaboration, and policy support, such approaches may significantly narrow the educational gap experienced by children with autism and foster their long-term academic success and social participation.

#### **4. CONCLUSION**

This study demonstrates that developing fine motor skills significantly improves writing skills in children with autism spectrum disorder (ASD). Through simple but structured interventions, such as squeezing balls, tracing dotted lines, putting together puzzles, and copying letters and words, children showed improvements in hand-eye coordination, control of writing instruments, neatness of writing, and the ability to copy letters and words. The children's writing ability scores increased from 38.7% to 62.5%, indicating improvements in both technical aspects (movement control, letter shape, and line

accuracy) and psychological aspects, such as confidence when writing. These findings also show that a multisensory, collaborative, individualized learning program (IOP) between teachers, parents, and experts can be an effective and applicable strategy in inclusive elementary school environments.

Overall, this study confirms that fine motor skills are an important foundation for writing in children with autism, and that systematic, consistent, and individually tailored interventions can improve both academic abilities and self-confidence. This intervention model is simple, cost-effective, and can be implemented by both teachers and parents.

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