

THE IMPACT OF FINE AND GROSS MOTOR SKILLS DEVELOPMENT ON WRITING SKILLS FORMATION IN PRESCHOOL

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ABSTRACT

Early language and writing development in preschool education is a crucial foundation for children's successful development and future academic achievement. Recent studies highlight the importance of acquiring writing skills at an early age, yet comparatively little attention has been given to how the preschool educational environment supports and promotes these skills. This study provides a theoretical analysis of the role of fine and gross motor skills in the development of writing skills in preschool-aged children, with particular attention to the significance of motor abilities in the writing acquisition process.

To explore the interconnection between writing skills and motor development, a systematic literature review was conducted, drawing on scientific and theoretical studies that examine the impact of children's physical development on their writing abilities. Pedagogical and regulatory documents emphasize the need to promote children's motor development and to ensure an environment that purposefully supports writing skills. Writing is understood as a complex cognitive and motor process involving auditory perception, letter recognition, and movement coordination. Therefore, the development of motor skills at an early age forms a critical foundation for the acquisition of writing skills.

The findings indicate that the development of fine motor skills, particularly the precision of hand and finger movements, significantly influences the ability to form letters and use writing tools. Gross motor skills provide body stability, posture, and coordination essential for writing.

The quality of the learning environment and pedagogical support is also essential, as it fosters children's motivation and engagement. The results confirm the need for a structured, evidence-based approach that recognizes motor skills development as a key prerequisite for writing acquisition.

Keywords: *emergent writing, fine and gross motor skills, pedagogical environment, prerequisites, preschool children, writing development*

Introduction

Writing skills in the preschool years develop as a complex and multidimensional process that involves language comprehension, thinking, motor abilities, and social interaction.

These skills do not emerge in isolation – their foundations are laid in early childhood through play, drawing, and imitation of writing (Dennis & Votteler, 2013; Byington & Kim, 2017).

Contemporary research emphasizes that writing is not merely a mechanical skill – it is also a cognitive, social, and cultural process that reflects the child's desire to express themselves symbolically and meaningfully (Dyson, 2009; Vygotsky, 1978). These abilities develop through both fine motor skills – such as finger muscle control, pencil grip, and movement precision – and gross motor skills, which provide posture and body stability during writing (Montessori, 2019; Chung et al., 2020).

The development of writing skills is also significantly influenced by the quality of the pedagogical environment and the professional actions of the teacher. National education guidelines in Latvia (Cabinet of Ministers, 2018; Preschool Education Curriculum, 2019; Skola2030, 2017) emphasize the importance of integrating movement into the learning process and creating an environment that is developmentally appropriate for the child.

The aim of this theoretical study is to analyze how the development of fine and gross motor skills influences the formation of writing skills in preschool-aged children, with special focus on structured movement activities and the role of teacher support.

Literature Review

Fine motor skills involve the function of small muscles, particularly the coordination of hand and finger movements necessary for precise actions such as drawing and writing (Brown Health, n.d.; Giagazoglou et al., 2001). To write, a child must be able to grasp a writing tool, draw lines, and form letters with accuracy. Byington and Kim (2017) and Clay (2000) emphasize that children acquire writing through early symbolic markings, which gradually develop into structured text.

The nine-stage model of emergent writing development – from scribbling to full sentences – allows for an assessment of children's conceptual and symbolic understanding of writing. A detailed description of this model is presented in the Results section (Byington & Kim, 2017).

Gross motor skills involve large movements such as walking, climbing, and balancing, which provide body stability, a prerequisite for writing (Chung et al., 2020; Giagazoglou et al., 2001). Writing also requires the ability to maintain posture and focus over time, supported by the stability of the spine and shoulder girdle.

Practical life activities – such as buttoning, drawing, and sorting – support both fine and gross motor development and should be integrated into daily learning activities (Montessori, 2019).

The three-domain model categorizes writing skills into three interrelated aspects:

- Conceptual domain – understanding the purpose and meaning of writing;
- Procedural domain – technical skills, such as letter formation and pencil grip;
- Generative domain – the ability to produce meaningful text.

This model provides a comprehensive view of writing development and is revisited in the Discussion section (Byington & Kim, 2017).

Writing development in preschool is closely linked to the quality of the pedagogical environment and the professionalism of the teacher. OECD reports (2020, 2021, 2025) emphasize that children's motor skills are strongly connected to language and writing development, advocating for the integration of movement activities as a part of the learning content. This view aligns with educational guidelines that describe the stages of motor development and their importance in acquiring writing skills (Preschool Education Curriculum, 2019; Skola2030, 2017).

In practice, aspects such as posture, pencil grip, and movement coordination are often overlooked, with primary focus placed on learning letters. This limits a child's ability to develop writing as a complex skill (Laganovska, 2023). Learning plans should be based on the child's developmental needs and include tasks that simultaneously enhance motor skills, attention, and self-regulation (Masterson, 2021).

Writing is a social and cultural process deeply connected to a child's experiences, identity, and need for self-expression. Within this approach, the teacher's task is to create an environment where writing becomes a meaningful form of expression, rather than a set of mechanical skills (Dyson, 2009).

Combining insights from OECD research (OECD, 2020, 2021, 2025), Latvian educational documents (Cabinet of Ministers, 2018; Preschool Education Curriculum, 2019; Skola2030, 2017), and theoretical perspectives (Byington & Kim, 2017; Dyson, 2009), it becomes evident that the pedagogical environment is not merely a background but an active factor in children's writing development. Only when a teacher intentionally integrates movement, language, and communication into the environment can a child develop writing as a meaningful form of expression.

Methodology

This study is theoretical in nature, and its methodology is based on qualitative analysis aimed at evaluating the impact of fine and gross motor skill development on the formation of writing skills in preschool-aged children. The analysis relies on a review of scientific literature, regulatory documents, and examples from pedagogical practice, which allows for the integration of theoretical insights with educational practice.

The study incorporates works by both international and Latvian authors that analyze the interrelation between writing skills and motor development in preschool-aged children, primarily published between 2000 and 2025. The literature was selected through scientific databases (EBSCO, ERIC, ProQuest) as well as resources available at the University of Latvia.

Latvian regulatory documents were also reviewed (Cabinet of Ministers, 2018; Preschool Education Curriculum, 2019; Skola2030, 2017) to determine how the acquisition of writing skills and motor development are reflected in the content and expected outcomes of preschool education. The analysis was conducted using a content analysis approach, identifying key categories and comparing them with international theoretical models.

In addition to literature and documents, the study also draws on examples collected by the author from preschool education practice in Latvia. These include descriptions of children’s manifestations of writing skills and examples of tasks that demonstrate the importance of fine and gross motor skills in the development of writing abilities. The examples were selected based on their relevance to the research aim – to illustrate the interrelation between motor skills and writing abilities in specific pedagogical situations.

The review of literature, regulatory documents, and pedagogical examples was carried out using thematic analysis. As a result, the main themes were identified: the prerequisites of fine motor skills for writing, the importance of gross motor skills in ensuring body stability during writing, and the role of the teacher and the pedagogical environment.

Latvian preschool education regulatory documents play a significant role in the study, particularly curriculum descriptions and national educational guidelines, which outline the expected learning outcomes across different stages of preschool education. These documents enable the analysis of how writing skill development is structured and how it relates to children’s motor abilities and teacher practices (Cabinet of Ministers, 2018; Skola2030, 2017).

The Latvian preschool education guidelines structure the acquisition of writing skills into several progressive stages, which enable the assessment of children’s progress and the provision of appropriate pedagogical support (Preschool Education Guidelines, 2019; see Table 1).

In addition to the analysis of regulatory documents, the methodology incorporates the nine-stage model of emergent writing development, which serves as a theoretical basis for assessing children’s individual writing skills and for adjusting the support provided by the teacher (Byington & Kim, 2017). The application of this model, supplemented with illustrative examples, is presented in the Results section (see Table 3).

Table 1 Description of writing skill acquisition levels in preschool education stages (based on Preschool Education Guidelines, 2019)

Preschool Education Stage	Beginning to Learn	Continuing to Learn	Achieved	Achieved in Depth
1.	–	–	–	–
2.	Writes individual letter elements, learning to correctly hold the writing tool.	Writes letter elements in an unrestricted space, correctly holds the writing tool.	Writes letter elements in an unrestricted space.	Writes letter elements in an unrestricted space and controls hand and finger muscles.
3.	Recognizes and writes some printed letters in an unrestricted space.	Recognizes and writes nearly all printed letters in an unrestricted space.	Writes printed letters in an unrestricted space	Recognizes and writes all printed letters and connects them into words to the best of their ability.

The methodological approach provides a foundation for comparing theory and practice and allows for conclusions about the necessity of structured motor development as a crucial prerequisite for the formation of writing skills in preschool education. It highlights the alignment between theory and practice in writing development and emphasizes the importance of incorporating structured motor development as an integral part of preschool education.

Results

This study is theoretical in nature, with the findings grounded in the analysis of scholarly literature, Latvian regulatory documents, and examples from educational practice. The analysis allowed for the identification of the key motor prerequisites for the development of writing skills in preschool-aged children and demonstrated how these prerequisites are reflected both in theoretical models and in pedagogical practice.

Research highlights from various authors emphasize that the acquisition of writing skills requires the development of both fine and gross motor abilities. Fine motor skills encompass the precision of hand and finger movements, muscular control, eye-hand coordination, and the ability to correctly grasp a writing instrument. Gross motor skills, on the other hand, provide body stability, balance, and posture, which are essential for sustaining attention and executing precise movements during the writing process (Byington & Kim, 2017; Chung et al., 2020).

By synthesizing the perspectives of various authors, it is possible to identify the main fine and gross motor skills that are closely linked to a child's ability to acquire writing skills (see Table 2).

The significance of fine and gross motor skills can also be observed in other areas of a child's activity, particularly in drawing. Drawing skills in preschool are often perceived as a form of artistic self-expression; however, research shows that they are closely linked to the development of writing skills. Both rely on a shared base of cognitive and motor abilities – in both drawing and writing, visuomotor coordination, spatial orientation, and the ability to represent symbols play a critical role (Pinto & Incognito, 2022). An analysis of preschool children's drawing and writing expressions reveals that the development of these skills occurs in parallel and mutually reinforces one another. These findings emphasize the need to systematically support the development of both drawing and writing skills from an early stage of education, as they not only enhance a child's ability to express themselves visually and verbally but also improve hand-eye coordination, which is a fundamental prerequisite for effective writing.

Preschool education policy documents in Latvia – the *Preschool Education Guidelines* (2019), *Skola2030* (2017), and the Cabinet of Ministers Regulations (2018) – emphasize writing development as a gradual process in which motor skills and visual-motor coordination play a crucial role. These documents describe writing acquisition through learning

Table 2 Key Gross and Fine Motor Skills for Preschool Writing
(adapted from Byington & Kim, 2017; Chung et al., 2020; Rowe & Neitzel, 2010; Laganovska, 2023; Preschool Education Curriculum, 2019; Skola2030, 2017)

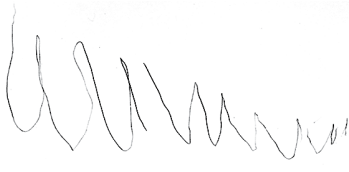
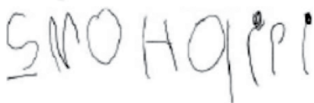
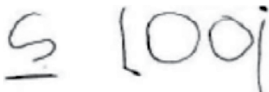
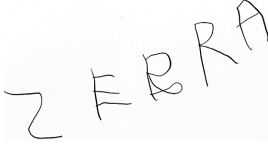
Gross Motor Skills	Fine Motor Skills
Spinal and shoulder stability – A strong spine and shoulder girdle provide stability, enabling the hands to perform precise and controlled movements during writing.	Finger muscle development and movement precision – Essential for properly holding and guiding a writing tool.
Arm and upper arm control – Helps the child guide the hand in the desired direction when forming lines and letters.	Coordination of hand and finger movements – The ability to accurately guide the hand and fingers during writing motions.
Body balance and stability – Proper sitting posture and body balance support stable hand movements and the ability to focus on writing for extended periods.	Precision of individual finger movements – The ability to move fingers independently of one another (e.g., thumb and index finger for holding a pencil).
Cross-lateral arm movements – The ability to use the right hand on the left side of the body and vice versa, facilitating more coordinated and efficient writing movements.	Pencil grip – The correct way of holding a writing tool and regulating pressure on the paper. Reproduction of lines and shapes – The ability to draw vertical and horizontal lines, circles, squares, and other shapes, which are foundational for letter formation. Hand-eye coordination – The ability to control drawing and writing movements while visually focusing on the task.

outcomes that outline a progression from reproducing lines and shapes to writing letters and words. To illustrate these principles, illustrative examples selected by the authors from preschool practice – children’s marks, letter imitations, and early attempts at word writing – are presented. They demonstrate how the requirements outlined in the documents are reflected in real pedagogical situations and how motor development is closely linked to writing progress. As shown in Table 3, these examples confirm that the stages described in international models are also observable in Latvian preschool practice.

An analysis of Latvian preschool education regulations – including national educational guidelines and curriculum documents – together with the nine-stage emergent writing development model, reveals significant correlations between the development of children’s motor skills and their ability to express meaningful written content (Byington & Kim, 2017; Cabinet of Ministers, 2018; Skola2030, 2017). In the Latvian preschool education system, writing proficiency levels are defined as a progressive process, but they do not explicitly reflect all nine stages included in the writing development model (Byington & Kim, 2017) (see Table 3).

This model allows for a structured analysis of the child’s understanding of writing throughout developmental progression-from unclear symbolic markings to meaningful sentences (see Table 3; Byington & Kim, 2017; author’s personal archive).

Table 3 Stages of Emergent Writing Development based on Byington and Kim (2017), supplemented with examples from Latvian children's writing

Stages of Emergent Writing Development	Examples from Byington & Kim (2017)	Examples from Latvian Children's Writing
Stage 1 – The child draws or marks something, usually scribbles.		
Stage 2 – Scribbling (makes marks or notes).		
Stage 3 – Wavy scribbling (writes in wave-like lines from right to left, imitates writing).		
Stage 4 – Writes letter-like symbols. Understands that information is written using letters but does not yet recognize them.		
Stage 5 – Writes strings of letters (uses symbols that resemble letters, writes in a straight line from right to left, using both uppercase and lowercase letters).		
Stage 6 – Writes a sequence of known letters as if forming words; spaces appear between letters, and some letters may be reversed or written in mirror image.		

Stages of Emergent Writing Development	Examples from Byington & Kim (2017)	Examples from Latvian Children's Writing
Stage 7 – Writes the initial, middle, or final letter or sound heard in a word. A word may be represented by a single letter.		
Stage 8 – Begins to write words (writes words using three letters, representing the initial, middle, and final sounds), writes phrases.		
Stage 9 – Writes words, sentences, and texts; begins to use punctuation marks and correctly applies uppercase and lowercase letters.		

Note. Adapted from Byington & Kim (2017). Latvian examples are from the author's personal archive.

For example, the ability to imitate letters or draw symbols (Stages 2–4) can be observed in the 4–5-year age range, during which the national guidelines emphasize line drawing, shape recognition, and early attempts at writing words (see Table 1). Meanwhile, the ability to use meaningful words and construct sentences (Stages 7–9) corresponds to the 6–7-year age range, which emphasizes writing words and short sentences.

Teachers' practices confirm that the development of children's writing skills is significantly influenced by the teacher's ability to recognize the child's developmental stage and apply suitable tasks. When a child is in the early stages of writing development, producing unstructured marks or symbols, appropriate activities include symbol imitation, sound-letter correspondence games, and movement coordination exercises (Byington & Kim, 2017; Skola2030, 2017). This highlights the necessity of intentional teacher support tailored to each child's developmental level.

Moreover, the analysis of the results shows that motor development activities – such as finger games, construction tasks, and practical life exercises – strengthen children's ability to transition from one stage of writing development to the next. The teacher's role here is to ensure an environment that offers ample opportunities for both motor experiences and symbolic expression.

The findings support the conclusion that there is a theoretically and practically substantiated connection between the level of motor development and the ability to

produce meaningful written text. The capacity to construct words based on phonological awareness and symbolic thinking is one of the most essential prerequisites for writing (Puranik & Lonigan, 2012).

Writing in preschool should be viewed as a social and cultural activity, where the goal is not merely technical letter mastery, but also personal and emotional expression (Dyson, 2009). The results show that children engage more fully in the writing process when the tasks are connected to their personal experiences and meaningful topics. This strengthens the need for a contextually relevant environment in which the teacher fosters not only technical abilities but also the child’s desire to express themselves in writing.

Discussion

The findings are consistent with the three-domain model of emergent writing, in which writing is viewed as an interaction between conceptual, procedural, and generative skills. This confirms that the development of children’s motor abilities is closely linked to the quality of their writing (Byington & Kim, 2017). The teacher’s task is to recognize the child’s developmental level and adapt activities in ways that support the transition from simple marks to structured sentences (see Table 4).

This multidimensional approach provides teachers with the opportunity to structure the learning environment and activities not only based on children’s technical skills but also on their understanding of the purpose of writing and their ability to generate meaningful content. The teacher becomes a mediator between the developmental stage and the possibilities for expression, integrating movement, language, and symbolic thinking into purposeful and developmentally supportive pedagogical practice.

The three-domain model is particularly important because it encourages the implementation of an individualized approach in practice. By understanding which domain is the least developed in a specific child, the teacher can select appropriate activities rather than focusing solely on the writing outcome. This perspective strengthens the teacher’s ability to differentiate tasks, thereby fostering each child’s potential.

To integrate motor, language, and cognitive skills in the writing development process, several internationally recognized programs are used in practice. These programs are based on multisensory and developmental approaches and provide teachers with a structured methodological framework and concrete examples of tasks for improving children’s

Table 4 Three-Domain Model of Emergent Writing. Adapted from Byington & Kim (2017)

Domain	Key Information
Conceptual	Understanding the purpose and function of writing. The child realizes that writing is used to convey information, communicate with others, and record thoughts.
Procedural	Technical skills required for writing: holding a pencil, forming letters, drawing lines. This domain is closely related to fine motor development.
Generative	The ability to creatively and meaningfully produce written text – words, sentences, or stories. This domain reflects the child’s ability to express ideas.

fine motor skills. Two widely used programs that connect fine motor skills, visual-spatial perception, and writing development are discussed below.

One of the most widely used methods for developing writing skills is the multisensory writing program *Handwriting Without Tears*, which is based on a sensorimotor approach and the belief that children learn most effectively when multiple sensory systems – vision, hearing, touch, and movement – are engaged. The content of the program is organized developmentally, and letters are taught in groups based on similarity. This approach is suitable for group instruction as well as individual or home settings, making it particularly appropriate for children with special needs. The program uses simple and child-friendly language, which facilitates its integration into daily teaching practices (Donica, 2015; Olsen, 2001).

The second key program selected for this study, which holds significant relevance in the context of developing preschool children's writing skills, is *Write from the Start* (Teodorescu & Addy, 1998).

The *Write from the Start* program offers a visual-motor and fine motor-based approach to preparing young children for writing. It includes over 400 differentiated exercises and activities that systematically develop hand-eye coordination, shape constancy, spatial organization, and an understanding of form and orientation. The program is divided into eight cumulative sections, and its materials – workbooks and a teacher's manual – allow for the structured documentation of each child's progress (Teodorescu & Addy, 1998).

Write from the Start is conceptually grounded in the recognition of the fundamental role that motor development and visual-spatial perception play in writing. Research shows that visuomotor coordination skills are directly related to writing fluency and accuracy (Seo, 2018; Martzog et al., 2019). Therefore, implementing such programs can be a valuable tool for supporting writing instruction, especially for children with delayed fine motor development.

This is a theoretical study; the nine examples of children's writing included are used illustratively rather than as empirical data and are therefore not generalizable. However, they help to concretize the alignment between theoretical models and Latvian educational regulations, thereby strengthening the theoretical contribution of the study and providing additional clarity on the links between theory, policy, and pedagogical practice.

Conclusions

The development of fine and gross motor skills forms a critical foundation for writing skill acquisition in preschool. Writing does not develop in isolation – it is influenced by movement coordination, spatial perception, and symbolic thinking, all of which must be purposefully and systematically developed.

The Latvian preschool education system provides a structured foundation for evaluating writing readiness. However, integrating theoretical models such as the three-domain approach allows for a deeper understanding of children's cognitive and expressive development.

Effective promotion of writing skills requires that educators understand each child's individual developmental level and are able to adapt tasks to meet those specific needs. Purposefully selected motor activities and a supportive environment enhance not only the acquisition of technical skills but also children's motivation and ability to express themselves in writing.

Multisensory and developmentally based programs, such as *Handwriting Without Tears* and *Write from the Start*, offer practical solutions for integrating movement, perception, and writing into everyday educational practice. The implementation of such approaches significantly strengthens children's ability to engage in meaningful written communication.

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