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Psychomotor Approaches to Graphomotor Skill Development in the Classroom

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ABSTRACT

Swiss psychomotor therapy is closely integrated into the national education system and plays a key role in promoting graphomotor development – an important foundation for writing and reading acquisition. This article presents two complementary tools: GRAFOS-2, a diagnostic tool for assessing the graphomotor skills of children aged 4 to 9, and GRAFINK, which provides teaching materials, a didactic framework, and guidelines for successful collaboration between psychomotor therapists and teachers. Both tools are based on a psychomotor approach that combines standardised assessments, qualitative observations, and practical strategies for inclusive education. They foster interdisciplinary collaboration between teachers and psychomotor therapists and promote developmentally appropriate, individualized support for children with and without graphomotor difficulties in the context of inclusive education. GRAFOS-2 is currently being adapted and standardised for Italian- and French-speaking regions, which underlines the international relevance of a psychomotor perspective on handwriting acquisition.

Introduction

Swiss psychomotor therapy is characterized by its institutional embeddedness in early education, particularly through mandatory inclusion in kindergarten and primary school curricula under national legislation. This framework ensures universal access for children experiencing challenges in integrating motor, sensory, emotional, social, and cognitive developmental processes—irrespective of socioeconomic or cultural background. The integration of psychomotor therapy into schools—and the department's internationally pioneering role in this context—can be traced back to its recognition as a school-based or therapeutic educational option around 50 years ago (Sägesser Wyss, 2024).

The structural integration of therapy within educational settings has fostered decades of specialized research in psychomotor therapy, for example in the field of graphomotor competencies development—a dedicated subfield of psychomotor therapy addressing the complex interplay between handwriting, fine motor control, and cognitive-emotional factors (Hurschler Lichtsteiner, 2023; Jurt Betschart et al., 2019; Maurer et al., 2023a; Maurer et al., 2023b; Sägesser Wyss, 2024; Sägesser Wyss et al., 2024; Sägesser Wyss & Eckhart, 2016; Truxius et al., 2025; Truxius et al., 2024; Vetter et al., 2009). This research and development is significant not only for Switzerland but also internationally.

This contribution provides an exemplary insight into Switzerland's longstanding expertise in graphomotor skills by presenting the diagnostic tool GRAFOS-2 (Sägesser Wyss et al., 2024). The instrument's design and application highlight the intersection between psychomotor therapy and education, emphasizing the essential collaboration between psychomotor therapists and teachers. GRAFOS-2 is intended to developmentally assess graphomotor competencies and to provide a foundation for supporting children with graphomotor challenges in both educational and therapeutic settings. As such, the tool is not only relevant within Swiss psychomotor therapy but is also currently being translated, standardized, and culturally adapted for use in Italian- and French-speaking regions.

This article begins by exploring the specific contribution of psychomotricity to graphomotor development and handwriting acquisition—expanding the traditional perspective of handwriting research. It then highlights the foundational role these skills play in the development of reading and writing abilities. Building on this conceptual foundation, it details the three components of the GRAFOS-2 instrument, illustrates the practical implications of a psychomotor approach, and outlines how lessons can be structured to support diverse learners in heterogeneous classrooms. The article concludes with discussing the ongoing adaptation of GRAFOS-2 for Italian and French educational contexts.

Theoretical Background

Description of a psychomotor perspective on graphomotor skills and handwriting acquisition

In Swiss psychomotor therapy, the acquisition of graphomotor skills is regarded as a complex psychomotor task. This perspective is grounded in the understanding that graphomotor development relies on gross and fine motor skills, sensory processing, and sensorimotor coordination (Sägesser Wyss, 2024).

Children develop graphomotor skills during early childhood through activities such as movement games or drawing long before they formally learn to write.

Core components of handwriting acquisition, such as visuomotor integration and fine motor skills, are therefore closely linked to broader aspects of early childhood development, as children draw upon foundational skills acquired early in diverse contexts (Vetter et al., 2021).

This approach emphasizes the acquisition of handwriting from a psychomotor rather than a purely linguistic perspective and introduces a diagnostic and supportive dimension that is often overlooked in both research and educational practice. Furthermore, psychomotor therapy attaches great importance to the full range of children's means of expression in their psychosocial environment (Vetter et al., 2009, 2021). The basic ability and willingness to communicate also form an essential foundation for written expression. In this respect, both psychomotor therapy and graphomotor research take a broader approach than traditional handwriting studies and offer a valuable link to the development of a child's general communication skills.

The importance of graphomotor competencies in literacy acquisition

Beginning writers must tackle the dual challenge of learning to compose texts linguistically while simultaneously mastering transcription processes, such as handwriting, typing, and spelling (Berninger & Winn, 2006). This occurs while their executive functions, which are fundamental cognitive processes (Evers, 2019), are actively engaged (Labrecque et al., 2013; Speck-Hamdan et al., 2016). In the context of graphomotor competencies, executive functions facilitate goal setting, planning necessary movements and actions, and evaluating, revising, and focusing on the writing process (Berninger & Winn, 2006). Working memory, a crucial component of executive functions, describes a memory system that supports our ability to maintain individual aspects while performing complex tasks (Baddeley et al., 2015). According to Odersky (2018) the limited capacity of working memory inevitably leads to conflicts during the simultaneous processing of subprocesses involved in written language production. When a child writes down an internally formulated idea, it must be held in working memory until the hand has transcribed it (Nottbusch, 2017). The duration of this process determines the length of interruption in the linguistic production of the text.

In the context of handwriting acquisition, it is therefore crucial to automate the subprocesses that can be

automated to free working memory capacity. This allows children to recall spelling rules or planning the next word to write. The subprocesses that can be automated, referred to as transcription skills, include the so-called "lower hierarchy" processes, which also encompass graphomotor skills (Sturm et al., 2017). In contrast, the processes of text production, i.e., the "higher hierarchy" processes, should not and cannot be automated (Odersky, 2018; Philipp, 2020; Sturm et al., 2017; Wicki et al., 2014). The distinction between "lower hierarchy" and "higher hierarchy" processes reflects the difference between automatable and non-automatable subprocesses (Sturm et al., 2017). This raises the question not only of how to identify processes that hinder the automation of graphomotor sequences in everyday school life, but also how to appropriately support children who struggle with those skills in the classroom. Although early difficulties with handwriting do not necessarily directly predict later handwriting (Duiser et al., 2020), research shows a certain degree of stability in handwriting among young children (Truxius et al., 2025). This suggests that graphomotor difficulties in kindergarten and early primary school years should not be underestimated.

Various studies show that graphomotor skills are central to handwriting acquisition: Children in early primary grades who copy shapes more accurately tend to write more legibly, their texts are of better quality, and they typically write more fluently (e.g. Duiser et al., 2020; Kaiser et al., 2009; Truxius et al., 2023). In contrast, children with difficulties in visuomotor integration often exhibit less legible handwriting (Feder & Majnemer, 2007; van Hartingsveldt et al., 2015). Similarly, children with poorer fine motor skills tend to show reduced handwriting legibility (Hamstra-Bletz & Blöte, 1993; Kim & Park, 2019; Parush et al., 2010) and lower handwriting fluency (Wicki & Hurschler Lichtsteiner, 2018). Fine motor skills and visuomotor integration, as central precursors of graphomotor skills, have also proven to be important predictors of early academic performance (Carames et al., 2022; Martzog et al., 2019; Suggate et al., 2018, 2019).

Moreover, a correlation has been identified between graphomotor skills and graphomotor self-concept (Schwery Klingele et al., 2025). It can be hypothesized that a low graphomotor self-concept is associated with decreased propensity to invest effort, reduced persistence in the face of challenging tasks, less ambitious goals, and increased avoidance behaviour (Denissen et al., 2007; Musu-Gillette et al., 2015). Consequently, this may have a significant impact on literacy performance (Connelly et al., 2005; Danna et al., 2016). These findings highlight the importance of early identification and targeted support for children experiencing graphomotor difficulties, for which the GRAFOS-2 instrument can serve as a valuable tool.

Diagnostics and approaches to support with GRAFOS-2

The diagnostic instrument GRAFOS-2 (Sägesser Wyss et al., 2024) is designed to assess the graphomotor development of children aged 4 to 9 years. The instrument is embedded in a child-friendly narrative framework and consists of three parts: a *screening* tool (quantitative method) for identifying children with graphomotor difficulties in a classroom context, an *observation sheet* (qualitative method) for analysing the writing process in everyday school life, and *differential diagnostics* (qualitative method) for detailed assessment of graphomotor development areas in children with difficulties. This comprehensive approach allows for a multifaceted understanding of a child's development, facilitating the creation of tailored support. The combination of quantitative and qualitative methods, as implemented in GRAFOS-2 (Sägesser Wyss et al., 2024), provides a solid foundation for holistic support.

The tool allows for a largely language-independent analysis of graphomotor precursor skills and the foundations for handwriting. This language independence is particularly important due to the complexity of handwriting acquisition. It enables the analysis of graphomotor skills as an automatable, "low-hierarchy" subprocess of text production (Sturm et al., 2017), independent of linguistic skills, and their targeted inclusion in support.

The *screening* is structured along the development of drawing geometric shapes and captures the central predictors of graphomotor skills: visuomotor integration and fine motor skills. The screening consists of two screening sheets. In Screening Sheet 1, all children draw

eight small basic elements of writing (i.e., line horizontal, line vertical, circle, cross, triangle, square, arc down, and arc upside), while first and second graders in addition draw four slightly more complex geometric shapes (i.e., connected loops, rhombus, drop, and horizontal eight) on Screening Sheet 2. On both screening sheets, children are asked to copy each of the shapes six times in 1 cm^2 boxes from a template. The small size of the shapes was chosen so that finger movements (as opposed to wrist and arm movements when drawing bigger shapes; the Visuomotor Integration Test (Beery et al., 2010) can be captured (Cameron et al., 2015). The accuracy of each copied shape is evaluated using predefined criteria and scored as either 1 (accurate) or 0 (inaccurate). For example, a triangle is considered accurate if it meets the following conditions: it consists of three straight lines, has no gaps, no corner exceeds 90 degrees, at most one line may be slightly curved, and the base of the triangle deviates no more than 20 degrees from the horizontal axis (Sägesser Wyss et al., 2024). The child's overall accuracy is then calculated as the mean score across all shapes.

Regarding the reliability of the screening, inter-rater agreement between two independent raters was assessed using Cohen's Kappa and yielded a value of $\kappa = 75$ (based on 712 shapes), indicating a substantial level of agreement (Altman, 1991). In addition, the internal consistency of the screening was high, with Cronbach's alpha values of .80 for the basic shapes (Screening Sheet 1) and .77 for the more complex shapes (Screening Sheet 2). These values are based on a norming sample comprising 670 kindergarten children and 2,016 school children (Sägesser Wyss et al., 2024). The screening procedure is standardized not only in its administration and scoring but also in its interpretation, ensuring consistency and reliability across assessments. This standardized approach enables the comparison of children's graphomotor performance and its classification within the graphomotor development trajectory, based on established norm tables. The tables are derived from the mean accuracy scores of children at specific ages. A mean accuracy score within 1 standard deviation (*SD*) of the age-specific mean indicates no need for graphomotor support. Scores exceeding 1 *SD* suggest a moderate need for graphomotor support, while scores exceeding 2 *SD* indicate a high need for graphomotor support. Such classification serves as a foundation for the development of targeted support. The screening is complemented by an observation sheet that supports targeted observation of the writing and drawing process, which is an essential component in developing support strategies. Observing posture and movement during GRAFOS-2 provides valuable insights into a child's stage of motor learning and the development of graphomotor coordination skills, without the influence of linguistic factors (Odersky, 2018). The observation sheet focuses on posture, movement ability, and the motivation with which children draw or write. For example, the following aspects are observed (Sägesser Wyss et al., 2024):

- **Sitting posture**: Maintaining a stable posture is essential for executing fine and graphomotor movements (Bertenthal & von Hofsten, 1998). If a child exhibits postural instability, this may indicate the need for additional support in developing gross motor stability, alongside age-appropriate graphomotor support.
- **Pencil grip and finger movements**: An optimal pencil grip supports efficient finger movements during writing or drawing, enabling control of the pencil primarily through the fingers—a hallmark of a mature pencil grip (Rolf, 2013). Mastery of this skill requires adjusting muscle tension and coordinating movements across the shoulder, arm, hand, and fingers while writing. It is often observed that children do not move their fingers adequately and tend to apply excessive pressure when writing, which can lead to quick fatigue and reduced writing endurance.

The observation is qualitative, based on theory-driven criteria. However, the need for support is also determined quantitatively here, i.e. by counting conspicuous areas. It is important to use the screening and observation sheet together to obtain a complete picture of the drawing result (Screening sheet) and the drawing process (observation sheet) in the school context. Some children may draw all the shapes on the screening sheets appropriately for their age, yet the drawing process may involve excessive

pressure, an immature pencil grip, and noticeable effort—, indicating a need for support despite the seemingly age-appropriate outcome. For children showing significant difficulties, the psychomotor specialist can conduct differential diagnostics with GRAFOS-2. The third part of the tool, differential diagnostics, enables an in-depth analysis of complex graphomotor development (Sägesser Wyss et al., 2024).

Additionally, fundamental, subject-specific analyses are conducted, such as the analysis of eye movements. Eye movements are important for the development of visual perception (Case-Smith & Clifford O'Brien, 2010). Coordinated head movements, which can be performed independently of shoulder girdle or trunk movements, form another area that is been analysed in the differential diagnostics. These are crucial for learning manual tasks and for adjusting the head appropriately when moving and acting in space (Bertenthal & von Hofsten, 1998). Another example of area of analysis in the differential diagnostics of children who showed difficulties in the screening is the analysis of selected perceptual aspects. These include basic tactile-kinaesthetic perception as the foundation of fine motor development and basic visual perception as a central foundation of visuomotor integration (Sägesser Wyss & Eckhart, 2016).

The results of the differential diagnostics provide detailed insights into child development in areas crucial for the development of graphomotor skills. This enables psychomotor therapists, in collaboration with teachers, to set targeted priorities for integrated support.

Psychomotor approaches to graphomotor skills

The diversity within a classroom is significant, with each child bringing different prerequisites for learning handwriting. This variety can be particularly challenging for teachers, as not all children achieve the same goals with the same tasks at the same time. However, if the teaching approach is adapted to the existing diversity (e.g. Sägesser Wyss et al., 2021), this heterogeneity can be seen as an enrichment and opportunity (Prengel, 2019). In this context, it is important to emphasize that the diagnostic process does not conclude with the administration of the GRAFOS-2. Instead, it should be continuously extended through ongoing classroom observations. The collaboration between the psychomotor specialist and the teacher plays a key role in fostering the continuous development of lessons that support all children. To support the success of multi-professional collaboration between psychomotor therapists and teachers, the GRAFINK framework model was developed at Bern University of Teacher Education (PHBern) (Sägesser Wyss et al., 2021).

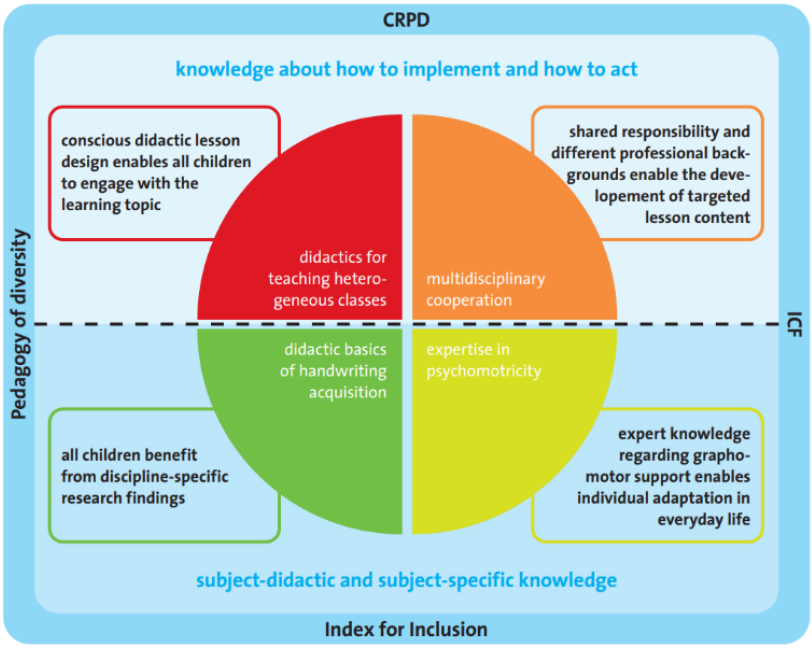

Figure 1. *The Frame Model GRAFINK (Sägesser Wyss et al., 2021)*[1]

The upper half of the model shown in Figure 1 underscores the importance of implementation and practical knowledge. This includes didactic competence in designing lessons for heterogeneous classrooms, as well as the establishment of clear rules and agreements that facilitate effective multi-professional cooperation.

The lower half of the model focuses on the integration of subject-specific didactic knowledge, typically contributed by the teacher, and subject-specific therapeutic knowledge related to supporting children with graphomotor difficulties, provided by the psychomotor therapist. Together, these areas of expertise form the basis for collaboratively developing inclusive lessons in which all children can actively participate.

The model is grounded in key international and theoretical frameworks, including the UN Convention on the Rights of Persons with Disabilities (UNO, 2006), principles of inclusive education (e.g. Prengel, 2019), the Index for Inclusion (Booth & Ainscow, 2002), and the International Classification of Functioning, Disability and Health (ICF) (WHO, 2017).

It is crucial to establish a strong foundation for each child to support long-term, motivated practice, as learning to write by hand is a complex and lengthy process (Achymy et al., 2022). Motivated practice over an extended period requires a variety of learning opportunities that ensure every child can engage with tasks they can complete successfully and independently (Sägesser Wyss et al., 2021).

This is where psychomotor approaches can be effectively utilized. Diverse sensorimotor approaches and individually tailored instructions enable different children to access shapes, letters, and writing (Santangelo & Graham, 2016). Letters and shapes can be perceived and recognized in different ways and can potentially be translated into drawings or written characters through visual, tactile-kinaesthetic, or auditory means. Children often find it exciting to identify shapes by the sound they make when drawn on a resonant surface, to feel letter shapes hidden in a bag, to draw letters on each other's backs and guess them, and finally to recreate what they have perceived through drawing.

To ensure that all children are both challenged and supported according to their abilities, it is important to adapt the level of difficulty to each child. One way to explore the same topic at varying levels of complexity is by grouping letters based on similar shapes. For example, one group of children might work with round shapes, another with letters that include curves, and a more advanced group with words or sentences containing curved letters. Using round shapes and letters as a common thread across activities can help unify learning experiences within the class (Sägesser Wyss et al., 2021).

For example, the lesson might begin with all children participating in a movement game involving circular motions, followed by a search for round-shaped objects in the room. Afterwards, some children might draw circular shapes on paper, others might write selected letters that feature round elements, and another group could look for words or sentences containing as many round letters as possible. Practicing shapes and letters is best done by involving as many sensory systems as possible (see Sägesser Wyss et al., 2021 for more information). It is important that a lesson includes activities that all children can engage in together, as well as differentiated tasks that cater to the individual skill levels of each child (Eckhart, 2019). Furthermore, it is essential for children's self-concept and motivation that they regularly reflect on what they have achieved during a specific lesson at their individual learning level, and consider what they would like to learn next (Santangelo & Graham, 2016). To strengthen a child's self-concept, they must recognize what they have newly learned and that they are making progress in comparison to their own previous performance (e.g. Lüdtke et al., 2005; Trautwein & Möller, 2016).

GRAFOS-2 in German, Italian, and French

Since its initial publication in 2016, the diagnostic tool GRAFOS has undergone continuous development (Maurer et al., 2023b) and is widely used by both teachers and psychomotor specialists. Due to its new perspectives on

handwriting acquisition and graphomotor difficulties, the instrument fills a critical gap in both educational and therapeutic settings. By emphasizing the key predictors of handwriting—particularly visuomotor and fine motor skills related to shapes and form sequences that are independent of any specific writing system—this approach is broadly applicable across countries and language regions.

GRAFOS-2 has recently been translated, adapted, and newly standardized for the Italian-speaking region through collaboration with researchers and practitioners in Italy, using a comprehensive sample. Following Italy, France and the French-speaking regions of Switzerland are preparing to translate and standardize GRAFOS-2 for use in their respective contexts. This growing international interest highlights that GRAFOS-2 addresses a gap in special education and psychomotor diagnostics, showing its relevance beyond national borders. However, transferring a diagnostic instrument across countries presents challenges—not only due to language differences, but also because of variations in educational systems and didactic approaches, all of which impact children's graphomotor development. For instance, psychomotor therapy is more firmly established within Swiss schools than in Italy or France. GRAFOS-2 places strong emphasis on close collaboration within educational teams and seeks to provide holistic support for children across both therapeutic and educational settings. While such interdisciplinary collaboration is more implemented in Switzerland, it remains an area for development in many other countries, where GRAFOS-2 may initially find its primary application in therapeutic rather than educational contexts.

Consequently, not only translation and standardization, meaning the establishment of new norms for Italy and France, but also adaptation to the local conditions is necessary to make the tool applicable in these regions. Comprehensive standardization within each region allows for comparisons of a child's development with peers from the same cultural and educational context, thereby helping to identify children in need of support. Early detection of graphomotor difficulties is crucial, as poor handwriting can negatively affect children's performance across various subjects and impact both their school motivation and self-concept (Duiser et al., 2020).

While the translation and adaptation of GRAFOS-2 for Italy are nearing completion, France and the French-speaking part of Switzerland are preparing to begin data collection in their respective regions to develop the respective norms. We have trained the project leaders from Italy, France, and the French-speaking part of Switzerland in the use of the diagnostic instrument, enabling them to carry out data collection and analyse the results, which will serve as the foundation for regional standardization. Looking ahead, our vision is to expand the usability of GRAFOS-2 to, for example, the UK and Spain, further broadening its accessibility. There is great potential in further developing and promoting a psychomotor perspective on handwriting acquisition and support internationally.

Discussion and conclusion

Handwriting is not approached as a purely linguistic or cognitive task, but as a complex psychomotor process shaped by fine motor skills, visuomotor integration, motivation, and self-concept. This perspective highlights the potential benefits of adopting psychomotor-informed and inclusive pedagogical practices in broader educational contexts.

The integration of psychomotor therapy into the Swiss education system offers a distinctive and effective framework for the early identification and support of children with graphomotor difficulties. The GRAFOS-2 diagnostic tool enables developmentally appropriate assessment of handwriting-related competencies, while GRAFINK provides a practical foundation for inclusive and differentiated handwriting instruction. Together, these tools create a valuable bridge between diagnostic insight and classroom implementation, underscoring the importance of interdisciplinary collaboration between teachers and psychomotor therapists.

As GRAFOS-2 is adapted for Italian- and French-speaking regions, careful consideration must be given to differences in educational systems, teacher training, and the structural conditions for collaboration between psychomotor therapy and schools. Its international relevance and language-

independent design offer promising potential; however, implementation may require context-specific solutions. In some countries, fostering stronger links between psychomotor therapy—often rooted in the medical domain—and the school system will be essential. Continued translation and adaptation of GRAFOS-2 could enable meaningful cross-national comparisons of early graphomotor development in relation to diverse educational frameworks.

[1] Figure reproduced from Sägesser Wyss et al. (2021), with permission.

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