MAGIC SCREENS AND PRECIOUS SIGNS
A screening project for the study of writing development

Gaia Di Giamberardino

Introduction

Handwriting is a vital skill in the educational journey of children in primary school. Research suggests that about 40% of a primary school student's activities require graphomotor skills [1]. Further studies indicate that 20% of children are at risk to develop graphomotor issues [2], with an additional 27% already demonstrating weak graphomotor abilities [3].

Effective handwriting is considered a key indicator for predicting academic performance in related cognitive areas, including spelling (Graham et al., 1997; Pontart et al., 2013), text composition [4] (Connelly, Dockrell, Walter, & Critten, 2012; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Puranik & Al Otaiba, 2012), and reading (Guan, Perfetti, & Meng, 2015; Shatil, Share, & Levin, 2000).

The cognitive load required for the motor execution of writing, the organization of letter sequences, and the spatial arrangement of letters on paper can hinder a child's ability to effectively plan the content of their writing [5, 6], taxing their ability to express themselves in written form. Additionally, legibility issues in handwriting, regardless of content, can lead to harsher assessments by educators [7].

Hence, graphomotor challenges can increase the effort required for writing, diminishing both performance and self-esteem (Cratty, 1994; Kalverboer, 1990; Laszlo, 1993; Sandler, 1992). As such, early identification and support for these challenges are crucial to improving the lives of affected children [8, 9, 10].

Method

The 'Magic Screens and Precious Signs' screening project is designed to develop new tools for identifying handwriting difficulties in the first years of schooling. The research's logic involves employing the analysis of drawing and writing motions to study the development of different graphomotor abilities and pinpoint early signs of difficulty in their acquisition.
Our team of clinicians has defined a protocol composed of graphic and writing tasks to be performed on a graphics tablet that records comprehensive data on writing execution such as speed, acceleration, pressure, and stroke execution times. For each task, a wide range of AI-based methods are used to select handwriting features that help identify typical and atypical graphomotor performance.
Participants will undergo a longitudinal study, tracking their skills from the end of nursery school to the third grade, spanning three years. At present, the protocol has been administered to 150 children in the last year of nursery school and then monitored in the following year during the first class of primary school. This same sample of children will be followed over the next two years to observe and analyze the acquisition of graphomotor skills over time.

These samples will be crucial to creating a database for implementing Artificial Intelligence (AI) techniques forming the basis for developing new clinical tools. These tools will provide specialists with useful elements for identifying graphomotor difficulties and preventing the onset of handwriting issues.

Results

This presentation offer preliminary findings from the first two years of the project, pending the completion of the study.

Conclusions

Our study focuses on the analysis and understanding of graphomotor skill development, emphasizing the role of technology in these processes. We explore how technological tools can be effectively utilized in the assessment and rehabilitation of handwriting skills. The primary objective is to detect early risk indicators, thereby mitigating the academic and social challenges associated with dysfunctional handwriting.

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