

The impact of typing and handwriting experience in children's letter and word learning:

Implications for literacy development

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The increasing role of laptops and tablets at schools has led children spend more time writing in digital formats than they do using pen and paper. However, recent research has demonstrated that the lack of handwriting practice can jeopardize the development of children's alphabetic skills, which are key for reading development (Torppa et al., 2016). While some authors argue that handwriting experience boosts the storage of accurate representations of letters due to the visual-motor production of their graphic forms (*graphomotor hypothesis*, Zemlock et al., 2018) some others claim that it is the variability of the instances generated in handwriting what improves the storage and recognition of letters (*variability hypothesis*, Li & James, 2016). One caveat of previous studies is that they have limited the scope of findings to letter-alphabetic learning, but not to word-orthographic learning, another important skill involved in reading (Deacon et al., 2019). Although studies with adults support the benefit of handwriting over typing on word learning (Wiley & Rapp, 2021) this finding has not been replicated in children (Mayer et al., 2020).

This study filled this gap in the literature by investigating why handwriting experience facilitates storage and recognition of novel letters and words comparing the graphomotor and variability hypotheses in 5 year old children. Over three days, 50 children learned 9 symbols (first learning phase) and 16 words made up with these symbols (second learning phase) across 4 learning conditions: copying the artificial letters-words by hand (G+V+), tracing the artificial letters (G+V-), typing the letters-words on a computer with different fonts (G-V+), typing with a single font (G-V-). Post test task included naming, writing and identification of the trained letters and words.

Results showed that participants who received the handwriting instruction performed better than the other three groups on all post test tasks; although the tracing group also showed a benefit over the two typing groups. These results provide clear support for the graphomotor hypothesis and illustrate the dramatic impact of handwriting experience on the development of alphabetic and orthographic representations. The implications of these findings for theories of reading development are discussed.