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# The tactile perception of uppercase, lowercase and manuscript letters in children and adults

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## Résumé

Reading acquisition allows access to written text and represents the spinal cord for all subsequent learning at school. Reading acquisition is inherently a multimodal learning process, requiring an audio-visual mapping between the sounds of language and visual letters. We have proposed a multimodal synergy hypothesis where multiple representations of letters in different systems could facilitate the visual recognition of ambiguous letters (Pegado et al., *Frontiers* 2014). We have probed this hypothesis by showing that multimodal training improves visual recognition, writing and reading fluency in 1st graders (Torres et al., *Current Biology* 2021). To understand a potential contribution of *tactile* perception of letters to such "multisensory mental model of letters" we studied here what type of letter format (uppercase, lowercase or manuscript) in Latin alphabet is the most suitable for tactile perception. We made this characterization in both 2nd graders children (n = 15) and literate adults (n = 24). We found good *spontaneous* blind tactile recognition without any training: out of the 26 letters (M= 19.58) in adults and (M = 10.58) in children. In both groups a higher recognition rate was found for uppercase > lowercase > manuscript letters. Importantly, analysis of *specific* letters shows extreme variations in recognition rate (ranging from ~25 to 100% in each format in adults). Interestingly, ambiguous letters for the visual system (mirror-letters such as p-q) are easily recognized by tactile perception. These results suggest that the tactile system can convey reliable information about some but not all letters and suggest its potential as a complementary source of information in early stages of literacy acquisition, especially targeting visually ambiguous letters.

**Mots-Clés:** reading, tactile perception, letters, multimodal, mental model

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