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

Marie Manote[1], Rochelle Ackerley[2], Anne Kavounoudias[2], and Felipe Pegado*[3]

[1]Aix-Marseille Université – Laboratoire de Psychologie Cognitive, Aix-Marseille Université – France
[2]Aix-Marseille Université – Centre National de la Recherche Scientifique, Laboratoire des Neurosciences Cognitives (UMR 7291) – France
[3]Université Paris Cité – Institut de Psychologie, Université Paris Descartes, Sorbonne Paris Cité, Laboratoire de Psychologie du Développement et de l'Education de l'Enfant (LaPsyDÉ - UMR CNRS 8240), Pôle pilote AMPIRIC, Institut National Supérieur du Professorat et de l'Education, Aix-Marseille Université, Marseille, France, Centre National de la Recherche Scientifique - CNRS – France

Abstract

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.

Keywords: tactile perception, letters, multimodal, mental model

*Speaker