The study was conducted in line with the recent „cross-modal” theories of perception, i.e. notions that sensory systems in the brain interact to process different sensory inputs. Its aim was to elaborate on previous findings regarding visual-‘other-modalities’ functional interconnections and, in particular, to provide causal link for early and ventral visual cortices contributions to tactile Braille letter recognition in sighted adults. Chronometric TMS was used to investigate temporal characteristics (5 consecutive time windows) of regions formerly assumed to be involved in the given task (i.e. left early visual cortex, the VWFA and the left early somatosensory cortex). It was then hypothesized that, in agreement with hierarchical model of visual processing, application of TMS to the early visual cortex would disrupt Braille letter recognition in the intermediate time window (120-320 ms post stimulus), whereas in the late time window it would affect the VWFA (320-520 ms, accordingly).

Seventeen female subjects’ scores were included in the analysis. All participants were untrained tactile Braille readers and underwent 8-month-long reading course prior to the study. In the TMS experiment, subjects were instructed to read aloud Braille letters presented in tactile modality. TMS sites were formerly localized based on functional and structural MRI scans in each participant.

Statistical analysis of the accuracy data was performed within the generalized linear mixed model. In the corrected model, no significant main effects were detected for both TMS site and time window alone, although its significant interaction was observed (F = 13.3, p < .001). Pairwise comparisons revealed that the accuracy rate decreased during the intermediate time window with regard to TMS application to the early visual cortex, same as for the VWFA for the late time window. The ANOVA for the reaction time data revealed that reaction times were significantly greater when TMS was applied to the early somatosensory cortex rather than the VWFA or the early visual cortex.

Results of the current study reinforce the notion of the “cross-modal” nature of the visual cortex in regard to its two-way incorporation in the tactile Braille letter recognition task. Furthermore, the study provides evidence for the “metamodal” account of the non-deprived brains organization in terms of causal, time-dependent characteristics of early and secondary visual cortices responses to computationally differentiated demands (i.e. early visual areas recruitment in the construction of a spatial representation of Braille dots and signs, and the VWFA support in creation of an abstract representation of a Braille letter). In addition, although TMS applied to the early somatosensory cortex did not affect the accuracy of the Braille letter recognition, it was shown to cause general slowdown in reaction times independent of the TMS time window, in contrary to what has been found so far.

The possible limitations of that study include: the lack of men’s group in the sample, not blindfolding subjects while undergoing the TMS experiment and recruitment of subjects with prior training in visual Braille letter recognition, but all of the potential criticisms about the study design are elaborately and elegantly justified by the authors.