Abstract

In the current thesis, we used a masked repetition priming paradigm and boundary paradigm to investigate how the biological and cultural factors influence the neural correlates of foveal and parafoveal preview effects and the neural correlates underlying that.

An influential theory in the field of visual object recognition proposes that it is the fast magnocellular (M) system that facilitates neural processing rather than the slower parvocellular (P) system. While written words can be considered visual objects, it is unknown whether magnocellular facilitation also plays a role in reading. In Study 1, we used a masked repetition priming paradigm with ERPs recorded to test whether repetition effects are mediated by the magnocellular system. In two experiments, we manipulated the magnocellular and parvocellular systems by contrasting high versus low spatial frequency and luminance versus color contrast, respectively. In the experiment manipulating spatial frequency, we obtained repetition effects only for the N1 component for both M- and P-biased primes. In the luminance versus color contrast experiment, repetition effects were found in the N1 and N250 for both M- and P- biased primes. Furthermore, no interactions were found between M- vs. P-biased prime types and repetition. Together these results indicate that M- and P- information contributes jointly to early neural processes underlying visual word recognition.

The absent finding of M facilitation over P pathway in Study 1 could also be due to the fact that the M cells are mostly found in the parafoveal area. In Study 2, we used a boundary paradigm with combined EEG and eye-tracking to measure preview effects in a

similar design from Study 1. As expected, valid previews elicited typical reduced N250 preview effects compared to invalid previews in both experiments for M- and P-biased previews. Furthermore, a marginal significant interaction showed that P-biased previews elicited larger preview effects than M-biased previews in the left hemisphere. Taken together, these results indicate that the M pathway did not mediate the preview effects, and M- and P-biased information contributes jointly to early neural processes underlying visual word recognition when the visual inputs come from the parafoveal, but P-biased information may potentially play a larger role in the early processes.

Readers have adjusted their visual system to a preferred reading direction through long-term experience. However, little is known about the neural correlates underlying these adjustments. In Study 3, we investigated visual word processing in participants from Taiwan and from Mainland China with different levels of reading experiences. Combined EEG-eye tracking was used with a parafoveal preview manipulation to investigate the neural correlates. EEG showed typical N250 preview effects, modulated by vertical reading experience, in which Taiwanese showed larger preview positivity in vertical reading direction than Mainlanders. The results indicate a specific mechanism for how cultural experience may shape the way people process visual information.

To summarize, the current thesis provides evidence that biological factors and cultural experiences could influence the neural correlates of foveal and parafoveal preview effects, and these factors have a great impact on visual word recognition.