Title
Stimulus-driven changes in the direction of neural priming during visual word recognition

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Fluent reading is one of the most important skills in modern world and demands fast and accurate analysis of letter-strings to distinguish learned words from neighbor words sharing similar lexical or phonological construction. Behavioral studies have shown that non-word primes with shared consonantal structures accelerate visual word recognition of subsequent target words. Interestingly, however, prime-target orthographic overlap at word-onset sharing initial syllable (or in some languages more) can induce decelerate reaction times to targets across different languages. This negative priming has been thought to arise from a word-level lateral inhibition from orthographic neighbors having orthographic or phonological overlap with targets. While recent behavioral studies suggest that the effect is more pronounced in the left hemisphere, its neuroanatomical basis has remained largely unknown. Candidate regions predicative from the existing literature include the lateral temporal cortex (LTC) associated with lexico-semantic memory, posterior occipito-temporal sulcus (pOTS) associated with abstract orthographic codes, left inferior frontal gyrus (IFG) for rapid activation of phonological codes, and dorsal premotor cortex (PMd) involved in decision making/motor planning. Present study used fMRI with a hemifield priming paradigm to explore neuroanatomical underpinnings of the inhibitory neighbor priming during visual word recognition (Experiment 1). In Experiment 2, a typical repetition priming paradigm was additionally performed to assess possible effects of the hemifield presentation procedure on the behavioral and neural effects observed in Experiment 1.

In total, 21 volunteers took part in both experiments (12 participants for Experiment 1, 9 participants for Experiment 2). In Experiment 1 neural activation was measured while participants made natural/artificial judgment of a centrally presented target, preceded by a masked prime flashed either to the left or right visual field. Consistent with previous studies, slower response time was observed for shared onset syllable pairs compared to no-overlap pairs. At the neural level, however, this effect was associated with robust repetition enhancement in the left IFG, while neither PMd nor LTC showed significant effects of priming associated with syllabic overlap. Experiment 2 employed the identical procedure except that prime-target pairs were either same or a different word without syllabic overlap. Behaviorally, participants displayed expected facilitatory effect of repetition priming, with reaction times faster for word-overlap prime-target pairs. At the neural level, regions-of-interest analysis revealed a classic pattern of repetition suppression at pOTS during visual word recognition. In joint analysis of both experiments, it was confirmed that the observed change in priming directions was significant and thus reflects the intrinsic nature of prime-target relations, rather than the hemifield priming procedure.