Distinct Contributions of Letter Identity and Letter Position to Visual Word Recognition: An ERP Study

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An ERP experiment investigated the unexpected finding of interference for word targets when they are primed by anagrams whose letters appear in reversed order (*pmuj – JUMP*). Four modulations were identified: position-independent letter processing, relative-position processing, absolute-position processing, and reversal processing. Results reveal a neural correlate to the interference effect.

Interest in letter position coding has recently increased among word recognition researchers. Lexical decision tasks using masked orthographic priming have been the primary tool for these investigations with researchers varying the relative positions of letters shared between the prime and the target (e.g., *baonmrla - ABNORMAL*; Guerrera & Forster, 2008). The most common finding is that lexical decisions are facilitated when the prime and target share letters in the same relative positions and there is no effect on target processing when relative positions are sufficiently disrupted. While testing the strength of this finding, Still and Morris (2008) included a condition in which the letters in the target appeared in the opposite order in the prime (e.g., reversed prime; *pmuj – JUMP*). Because relative letter position was completely disrupted, no effect was expected. Surprisingly, interference was obtained. The present study was designed to further investigate the basis of this interference by examining event-related potentials (ERPs) elicited by reversed primes and targets.

On each trial a briefly displayed (35 ms), masked prime was presented followed immediately by a target word (300 ms). Participants ($N = 32$) monitored the list of targets and were instructed to press a button when they saw an animal word. Critical trials required no overt response and included 40 reversed pairs, 40 transposed pairs (*ujpm – JUMP*), 40 neighbor pairs (*junp – JUMP*), and 40 control pairs (*bael – JUMP*). EEG was continuously recorded and was averaged offline at the subject level. Repeated-measures ANOVAs were used to test for differences between the conditions at specific electrodes and timeframes.

The ERP data revealed four modulations distinguishing the different types of trials. These ERPs reflected: 1. Letter processing independent of position: the neighbor, transposed, and reversed conditions differed from the control condition. 2. Processing of relative position: the neighbor and transposed conditions differed from the mirror and control conditions. 3. Processing of absolute position: the neighbor condition differed from the other conditions. 4. Processing of reversals: the reversed condition differed from the other conditions.

These data suggest that several independent processes contribute to visual word recognition and reveal a neural correlate to the interference observed for reversed primes and targets. Implications for models of visual word recognition will be discussed.