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Priming of semantic classifications by novel subliminal prime words ☆

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Abstract

Four experiments demonstrate category congruency priming by subliminal prime words that were never seen as targets in a valence-classification task (Experiments 1, 2, and 4) and a gender-classification task (Experiment 3). In Experiment 1, overlap in terms of word fragments of one or more letters between primes and targets of different valences was larger than between primes and targets of the same valence. In Experiments 2 and 3, the sets of prime words and target words were completely disjoint in terms of used letters. In Experiment 4, pictures served as targets. The observed subliminal priming effects for novel primes cannot be driven by partial analysis of primes at the word-fragment level; they suggest instead that primes were processed semantically as whole words contingent upon prime duration.
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1. Introduction

To what extent are subliminal stimuli processed semantically? One line of research addressing this question has employed binary categorization tasks, in which visible target stimuli are preceded by masked primes and are to be classified in one of two semantically opposite categories (Greenwald, Klinger, & Schuh, 1995). The primes are either in the same category as targets (congruent) or not (incongruent). A so-called category congruency effect is said to occur if participants respond faster or more accurately (or both) on congruent than on incongruent trials.

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For example, when words are to be classified as positive or negative, target words (e.g., sunshine) are often evaluated faster and more accurately when they are preceded by evaluatively congruent prime words (e.g., priest) than by evaluatively incongruent prime words (e.g., hate; Klauer & Musch, 2003). Category congruency priming of this kind differs from so-called semantic priming (Neely, 1991) in that both congruent and incongruent prime-target pairs are categorically related: Congruent primes and targets share the same category membership (e.g., the category of positive words), incongruent primes and targets are members in semantically opposite categories (e.g., the target is a member of the set of positive words, whereas the prime is a member of the set of negative words). As pointed out by Lambert et al. (2003), a more appropriate structural analogy than the semantic-priming paradigm is Jacoby's (1991) process-dissociation paradigm. For congruent prime-target pairs, responding on the basis of the target as well as responding on the basis of the prime lead to the correct answer. In the language of the process-dissociation method, responding in a controlled way to the target word leads to the same response as responding in the absence of control to the task-irrelevant prime word. For incongruent prime-target pairs, responding in a controlled way to the target and responding to the task-irrelevant prime in the absence of control lead to contradictory responses. Unintentional influences of the prime word are reflected in differences in performance for targets in congruent relative to incongruent pairings.

In this line of research, evidence for reproducible subliminal priming has accumulated. For example, Draine and Greenwald (1998), using a valence-classification task, found replicable category congruency effects for masked prime words selected from the same set as the target words. One way to explain the observed subliminal category congruency effects is to assume that primes are processed semantically. For example, Dehaene et al. (1998) argued that participants unconsciously apply the task set for target processing to the prime words. Congruent prime words thereby acquire the power to evoke the same response as target words, leading to facilitation, whereas incongruent prime words bias the opposite response, leading to interference.

Subsequent results suggested alternative explanations of these findings. Abrams and Greenwald (2000) as well as Damian (2001) found that primes were only effective if they had repeatedly been responded to as visible targets. In other words, there was little priming by new stimuli that had not appeared as targets in the classification task before. Abrams and Greenwald (2000) demonstrated that even fragments consisting of a few letters of prior targets sufficed to elicit category congruency effects; it was not necessary to present the entire word as prime. In a similar vein, Kouider and Dupoux (2004) showed that pseudowords formed by transposing the letters of previous targets can engender similar category congruency effects as the targets themselves when used as primes. Finally, Greenwald and Abrams (2002) found that even single consonants (repeated in a letter string, e.g., LLLLL) from prior targets (tulip) can have this effect. The explanations that were proposed for these findings differ in several respects, as explained next, but they agree that masked primes are not processed as deeply as targets, typically only at the level of word fragments of one or more letters, undermining the hope to demonstrate semantic processing of subliminal primes by means of category congruency priming.

For example, according to an account by *evolving automaticity*, as words are repeatedly classified, an association between the word and the appropriate response (Damian, 2001) or between the word and a more abstract response-related representation such as its response category (Abrams, Klinger, & Greenwald, 2002) is formed, curtailing the need for semantic processing of the word. The associated response-related representation is also activated, although perhaps only weakly, when a target later appears as prime. This biases the response to the current target, accounting for category congruency priming. Note that the account by evolving automaticity must postulate that associations are also formed between word *fragments* and response-related representations to be able to explain the above-reviewed findings.

Another explanation assumes that targets' mental representations are strongly activated in the course of repeated classifications. In this highly activated state, a representation including semantic information about the target's category membership can already be triggered by partial visual information such as by a masked fragment of the whole word. The triggered semantic information then interacts with the category information that is gathered from the current target in an evidence-accumulation response-selection process (Abrams & Greenwald, 2000; Broadbent & Gathercole, 1990), leading to category congruency effects in the absence of a proper semantic analysis of prime words.