

# Implicit Word Cues Facilitate Impaired Naming Performance: Evidence from a Case of Anomia

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Word-finding difficulties observed in some patients with anomia have been attributed to an insufficient activation of phonology by semantics. There are, however, few direct tests of this hypothesis. This paper reports the case of FR, who presented with anomic aphasia following temporal lobe epilepsy and a cavernoma in the left superior temporal lobe. His anomic deficit was characterized by: (1) no apparent associated semantic impairment; (2) item consistency for accuracy and errors across different administrations; (3) accuracy strongly correlated with word frequency; and (4) a partial, albeit weak, knowledge of the gender of unnamed items. We conducted a naming experiment in which target pictures were implicitly primed by briefly presented masked words. Results showed that the prior presentation of the written target name improved accuracy. When compared with unprimed trials, the presence of the primes also increased phonological errors and decreased semantic errors. We argue that automatic phonological activation derived directly from the implicit written primes interacted with the remaining phonological input from the picture's semantic representation leading to increased accuracy and a change in the balance of error types. © 2001 Academic Press

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## INTRODUCTION

Patients with anomia can be split into three broad categories. *Semantic* anomia follows directly from disruption to conceptual knowledge (semantic memory) in the context of degenerative disorders (e.g., semantic dementia: Hodges, Graham, & Patterson, 1995) or following CVA (anomia with lexical comprehension disorders: Gai-

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notti, Silveri, Villa, & Micelli, 1986), especially where the infarct is sufficiently large to include Brodmann areas 22, 21, and 37 in the middle and posterior temporal lobe (Chertkow, Bub, Deaudon, & Whitehead, 1997). *Phonological* anomia is an appropriate description for the anomia observed in most cases of CVA where word-finding difficulties are most commonly associated with a generalized deficit of phonology (Gagnon, Schwartz, Martin, Dell, & Saffran, 1997; Goodglass et al., 1997). The term *classical* anomia can be reserved for those patients whose anomia does not seem to be associated with semantic or phonological deficits (Geschwind, 1967; Lambon Ralph, Sage, & Roberts, 2000). These patients appear to retrieve appropriate conceptual knowledge but are unable to activate phonology sufficiently to produce the target word. There are two possible reasons for such a pattern: semantic knowledge for the target item is complete but subsequent activation of the phonological form is prevented in some way (Graham, Patterson, & Hodges, 1995; Kay & Ellis, 1987); the alternative explanation rests on the assumption that the degree and quality of semantic activation required for comprehension vs. production is quite different (Gainotti, Silveri, Daniele, & Giustolisi, 1995). Lambon Ralph, McClelland, Patterson, Galton, and Hodges (in press) were able to demonstrate this fact in both longitudinal analyses of patients with progressive and selective semantic deterioration (semantic dementia) and a simple computational network. With mild damage to the system that supports conceptual knowledge, overt performance is characterized by predominant word-finding difficulties associated with little or no measurable decline in comprehension—semantic activation is sufficient to support differentiation among semantic competitors at the level of conceptual knowledge but even weak damage at this stage of processing means there is insufficient input to phonology to drive speech production (which is exacerbated by the arbitrary relationship between semantic and phonological representations: Lambon Ralph et al., 2000). The question of whether one or both of these explanations for classical anomia is correct will not concern us in this paper. The central issue to be addressed here revolves around the nature of the remaining phonological activation in this type of anomic patient.

The fact that a patient cannot produce a specific name does not imply that there is no activation of the representations, which underpin the target word form. Perhaps the most obvious evidence for this comes from tip-of-the-tongue (ToT) phenomena observed in some patients with anomia (Kay & Ellis, 1987). Some patients can reliably give the gender of nouns or the correct auxiliary of an intransitive verb (e.g., the Italian anomic, Dante: Badecker, Miozzo, & Zanuttini, 1995; Miozzo & Caramazza, 1997). Other patients can indicate the number of syllables in the target form and whether it is a compound word or not (Lambon Ralph, Sage, & Roberts, 2000), while others can give the first letter of the item's name (Nickels, 1992).

There are a number of other methods by which partial activation of phonology by semantics can be inferred. These all involve the use of another input modality (e.g., written words or spoken words/phonemic units) to provide additional phonological activation that summates with that derived directly from semantics (Bajo & Cañas, 1989; Hillis & Camarazza, 1991; Lambon Ralph, Cipolotti, & Patterson, 1999). In the spoken domain, the most obvious example is that of phonemic cueing in which some of the phonemes in the target name (given by the experimenter) are sufficient to improve naming performance in the anomic patient. Although some anomic patients do not respond to a single phonemic cue (Howard, 1995; Kay & Ellis, 1987; Lambon Ralph, 1998), a significant improvement in naming performance can be observed given longer phonemic cueing even for items that the patient consistently fails to name across repeated testing sessions (Lambon Ralph, 1998; Lambon Ralph, Cipolotti, & Patterson, 1999). The critical point is that, at least in these cases, the length of the successful cue was still too short to identify the target name uniquely

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