

# Toward a frontal lobe disconnection model of deep dyslexia: The role of semantic feedback in phonological false memories

Chris Westbury<sup>a,\*</sup>, Lori Buchanan<sup>b</sup>

<sup>a</sup> Department of Psychology, P220 Biological Sciences Bldg., University of Alberta, Edmonton, AB, Canada T6G 2E9

<sup>b</sup> Department of Psychology, University of Windsor, Windsor, ON, Canada N9B 3P4

Received 31 May 2005; received in revised form 6 September 2005; accepted 8 September 2005

---

## Abstract

We use a false memory paradigm to investigate the extent to which phonological relations of a target word may be implicated in semantically driven access of that target word. We are specifically interested in understanding how access to orthography may limit the scope of this implication. Our interest in these questions is directly motivated by the claim that the probability of deep dyslexics making a semantic error in reading a word is affected by the number of close phonological relations of the word (Buchanan, L., Hildebrandt, N., & MacKinnon, G. E. (1994). Phonological processing of non-words by a deep dyslexic patient: A rowse is implicitly a rose. *Journal of Neurolinguistics*, 8, 163–181; Buchanan, L., Hildebrandt, N., & MacKinnon, G. E. (1996). Phonological processing of non-words in deep dyslexia: Typical and independent? *Journal of Neurolinguistics*, 9, 113–133). We use the study list in a false memory paradigm to semantically prime words. We look for false recognition effects among phonological relations of the semantically primed words in both modalities, with and without simultaneous orthographic overlap. The critical lures of interest in the experiments are words that are related by orthographic or phonological overlap to the unseen semantic target. We found increased false recognition rates for phonological associates of the unseen semantically-primed target in the auditory modality, only among words with no orthographic overlap with the unseen semantically-primed target. The locus of overlap and the phonological neighborhood size of the phonological relation also plays a role in the false memory rate. In a related experiment, we showed that the phonological neighborhood and concreteness of critical lures also mediates the probability of a semantic false memory. These results are discussed with respect to a frontal lobe disconnection theory of deep dyslexia, which posits that semantic errors in deep dyslexia are result from impoverished constraints to prefrontal regions that are implicated in semantic and phonological access of written words.

© 2005 Elsevier Ltd. All rights reserved.

**Keywords:** Deep dyslexia; Prefrontal cortex; Phonology; Semantics; Semantic errors; Reading; False memory paradigm

---

---

\* Corresponding author. Tel.: +1 780 492 5275; fax: +1 780 492 1768.

E-mail address: chrisw@ualberta.ca (C. Westbury).

A fluent reader has the impression, in reading a single word, of simply working on that one word. Psycholinguistic research has demonstrated that a great deal of complex computational effort underlies that impression of focused simplicity. We know that a skilled reader is sensitive to the frequency, regularity, and number of orthographic neighbors (among other variables) of each word, because each of these factors measurably impacts how easily the word can be accessed. We therefore know that a reader of a single word has not only accessed the word, but set into motion a great sweep of spreading activation that has implicated a great many other words as well. This paper focuses on a different aspect of language that may appear equally simple and unitary from a phenomenological perspective, namely, accessing a word from its semantics. If asked to name a four-legged animal that barks and is often kept as a pet, most of us can quickly produce the word *dog*. In the easiest cases, the impression we have is much like that impression we have in reading a word: we feel that we have plucked only the single word we need directly from a stored lexicon. The work in this paper explores the possibility that the act of selecting a word using semantic input is much like selecting a word using visual input: underlain by a great sweep of spreading activation that implicates many other words en route to the target word. In particular, our interest lies in investigating the extent to which phonologically related words of a target word may be implicated in semantically driven access of that word. We are also specifically interested in understanding how access to orthography may limit the scope of this implication.

Our interest in these questions is directly motivated by the hypothesis that the probability of making a semantic error in reading a word is affected by the number of close phonological relations of the word. This hypothesis derives from work with deep dyslexia. Deep dyslexia occurs in previously literate adults following brain damage. Patients with the syndrome show numerous difficulties in single word reading, exhibiting visual/phonological errors, derivational errors, and a profound difficulty in sounding out non-words. However, the defining feature of deep dyslexia is the production of semantic errors during word reading (e.g. reading *leg* as *foot*). Such errors are produced by deep dyslexics without awareness. Buchanan, Hildebrandt, and MacKinnon (1994, 1996) proposed that the reading deficits characteristic of deep dyslexia result from a selection impairment in the phonological output lexicon, where phonological information is assembled during lexical access. In order to test this hypothesis, they manipulated the number of phonological neighbors in a word reading task. A phonological neighbor is a word that differs by a single phoneme from a target word. For example, words *pot* and *kit* are both phonological neighbors of *cot*. The phonological neighborhood of a word (PN) is the number of words that differ from a target word by exactly one phoneme. PN is used as a measure of phonological representativeness. Words with a large PN are, by definition, very similar phonologically to many other words. Words with a small PN are phonologically more distinct. Buchanan et al. showed that deep dyslexics tended to produce more semantic errors in reading words with large rather than small PNs. They also showed there was no similar effect for the number of orthographic neighbors.

The experiments reported here constitute an attempt to find a normal model of this sensitivity of semantic access to PN, and to study in more detail whether it may be modulated by modality (visual versus auditory), position of overlap (early versus late) between the semantic word and its phonological neighbors, and nature of overlap (purely phonological versus phonological and orthographic). We propose a neurologically-motivated hypothesis—frontal lobe disconnection theory of deep dyslexia—for the locus of the semantics/phonological N interaction effect. As an initial test of the hypothesis, we conducted an experiment to see if there is a concreteness effect in the sensitivity of semantic access.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات