

## RE-VISITING “SEMANTIC FACILITATION” OF WORD RETRIEVAL FOR PEOPLE WITH APHASIA: FACILITATION YES BUT SEMANTIC NO

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### ABSTRACT

Previous research has shown that word-to-picture matching for targets that cannot be named at pre-test results in improved naming relative to untreated control items for people with aphasia. This paper replicates and extends this finding and investigates its source. Is the effect a result of priming of semantic representations, or of post-semantic mechanisms in word retrieval?

The first experiment shows that word-to-picture matching with unrelated distractors improves naming at short (2-3 minutes) and long (up to 25 minute) lags. There was no effect of being made aware of the relationship between word-to-picture matching and picture naming. People who have a semantic impairment improve only with a short lag between word-to-picture matching and naming. Participants with less semantic impairment show larger priming effects that are equal at short and long lags between word-to-picture matching and naming.

The second experiment shows that the facilitation effect is just as large for word-to-picture matching with unrelated distractors as with semantically-related distractors. Furthermore, overall there was no difference between matching with coordinate items and with associated items.

The results of these experiments show that facilitation of naming by word-to-picture matching in people with aphasia cannot be a result of the priming of semantic representations. Instead they are consistent with two effects: word-to-picture matching results in priming at a lemma level for aphasic people with a semantic impairment that is only found with a short lag between word-to-picture matching and naming. Word-to-picture matching causes priming of the lemma to output lexicon entry mapping that benefits participants with less semantic impairment that is evident at both a short and long lag between word-to-picture matching and naming. These findings fit well with previous research on repetition priming of naming with normal subjects.

Key words: aphasia, anomia, priming, facilitation, naming, semantic therapy, word retrieval

### INTRODUCTION

Understanding of the factors that affect the ease of word retrieval are important both for developing theories of word retrieval that can apply both to normal subjects and people with aphasia, and for developing theories of how manipulation of these factors can be used in therapy for people with aphasia. Different types of factors can be distinguished: several properties of target words can make them more likely to be successfully retrieved by people with aphasia or more rapidly retrieved by normal people. For instance normal subjects can name items with high frequency names faster than those with low frequency names (Oldfield and Wingfield, 1964). Similarly people with aphasia can name pictures with high frequency names more accurately than those with low frequency names (Newcombe et al., 1965). Whether these effects should be attributed to frequency or age of acquisition is an issue that is vigorously debated but irrelevant to this paper.

Such research seeks to establish a mapping between effects found with normal subjects and people with aphasia. In this paper we seek a

reconciliation between these sources of evidence in a different area, asking the question: how does a previous encounter with a target word affect the probability of successful word retrieval?

In a series of seminal papers, Weigl (1961, 1980; Weigl and Kreindler, 1960) described a technique that he named “de-blocking”. If an inaccessible word is presented in a relatively unimpaired task – for example word-to-picture matching – this will, Weigl (1961, 1980) argued, result in an increased probability that the word can be produced correctly in a relatively impaired task – for example, picture naming. Weigl (1961, 1980) claimed that there are two conditions that must be met for this result to be obtained. First, that there should be a short interval between the de-blocking task (e.g., word-to-picture matching) and the de-blocked task (e.g., picture naming). Secondly, that the person with aphasia should be unaware of the relationship between the de-blocking task and the de-blocked task.

Weigl’s (1961, 1980) papers inspired a series of papers on the facilitation of naming in people with aphasia that were also motivated by data on priming of word retrieval in normal subjects.

Patterson et al. (1983) reported results showing that both phonemic cueing and word repetition were very effective in immediately eliciting a target word. However, the effects were short lived; when pictures whose names had been repeated or phonemically cued were presented for naming after a short delay there was no significant advantage for items treated by either method relative to untreated control pictures.

In contrast to these rather disappointing results, Howard et al. (1985) found long-lasting item-specific facilitation from tasks requiring people with aphasia to process the meaning of a word that was the name of a picture that could not be retrieved at pre-test relative to untreated control items. So for instance, in Experiment 2, spoken word-to-picture matching resulted in approximately 50% correct naming, when the corresponding picture was presented for naming after a lag of six intervening items and about 2-3 minutes compared to 14% correct for untreated control items, and this advantage was maintained when the same pictures were re-presented for naming about 25 minutes later and, again, 24 hours later. Across a series of experiments, Howard et al. (1985) established that similar effects are found for spoken word-to-picture matching, written word-to-picture matching and yes/no semantic judgments (e.g., ‘Does a cow eat grass?’); all that seemed to be necessary to obtain the effect was a comprehension task requiring access to the semantics corresponding to a hard-to-name picture. They also established that this facilitation effect could be found for people with aphasia from all the “classical” diagnostic groups (Broca’s, anomic and conduction), and that it could be found both with people with impaired scores and normal scores in an early version of the Pyramids and Palm Trees test, that requires semantic judgments on pictures .

At what level of representation is this facilitation occurring? We will frame our discussion in terms of the model in Figure 1. This, like most contemporary models of language production has two stages in the mapping from semantics to phonology (Garrett, 1980; Levelt, 1989; Levelt et al., 1999; Dell and O’Seaghdha, 1992; Dell et al., 1997; Butterworth, 1980, 1983). The first stage involves using a semantic representation to access an abstract lexical node – in Levelt’s terms, the lemma. This, then, allows the speaker to retrieve both a syntactic specification of the word (not relevant to this paper) and a representation of its phonological form in the phonological output lexicon. The process of phonological assembly then generates a specification that can be used to drive articulatory programming (Levelt et al., 1999; Nickels and Howard, 2000). Although not directly relevant to this paper, the model in Figure 1 also incorporates a distinction between object concepts and lexical semantics (word meanings), acknowledging that

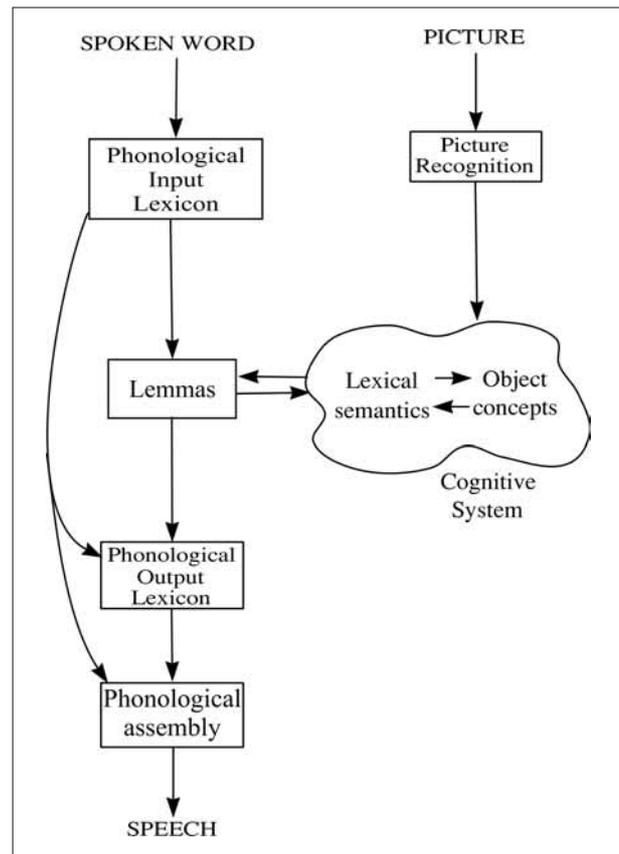


Fig. 1 – A model of the processes involved in picture naming and spoken word comprehension.

lexical semantics cannot be reduced to object concepts (see e.g., Nickels, 1997; Bierwisch and Schreuder, 1992).

Howard et al. (1985) considered the level at which facilitation might be occurring. They rejected the possibility that it was due to priming at the level of the phonological output lexicon for two reasons. First, because Patterson et al. (1983) had found that both word repetition and production of a name in response to a phonemic cue have very short term effects, and, secondly, because none of the “semantic” priming tasks involved overt word production. They suggest two alternative possibilities. The first is that priming is at the level of lexical semantics: the word comprehension tasks “operate by priming access to the complete verbal cognitive codes corresponding to the picture name” (Howard et al., 1985, p. 76). The second is that priming is at the lemma level [that Howard et al. (1985) following Butterworth (1979, 1980) call the ‘semantic lexicon’]. Access to semantics during the comprehension task will necessarily involve activation of the target lemma. They go on to suggest that “When, after... a word comprehension task, the patient is asked to name a picture, the semantic lexicon may be addressed by only partial semantic information from the cognitive system; of the range of entries specified by this information, only the entry corresponding to the name used in the comprehension task will be primed – as a result

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