

Contextual priming in semantic anomia: A case study

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Abstract

The present case continues the series of anomia treatment studies with contextual priming (CP), being the second in-depth treatment study conducted for an individual suffering from semantically based anomia. Our aim was to acquire further evidence of the facilitation and interference effects of the CP treatment on semantic anomia. Based on the results of the study of [Martin, Fink, and Laine \(2004a\)](#), our hypothesis before the treatment was that our participant would show short-term interference and at most modest and short-term benefit from treatment. To acquire such evidence would not only be important for the choice of anomia treatment methods in individual patients, but would also prompt further development of the CP method. The CP technique used for our participant included cycles of repeating and naming items in three contextual conditions (semantic, phonological, and unrelated). As predicted, the overall improvement of naming was modest and short-term. Interestingly, the contextual condition that corresponded with the nature of our patient's underlying naming deficit (semantic) elicited immediate interference in the form of contextual naming errors, as well as short-term improvement of naming. Based on this and a recent study by [Martin et al. \(2004a\)](#), it appears that despite short-term positive effects, in its current form the CP treatment is not sufficient for those aphasics who have a semantic deficit underlying their anomia. The possible mechanism and directions for future research are discussed.

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1. Introduction

Contextual priming (CP) is a theoretically motivated and relatively simple naming treatment technique that was originally developed to test predictions of different word-production models ([Laine & Martin, 1996](#)). It has since proved to have potential as a technique to be used in anomia treatment (see [Martin, Fink, & Laine, 2004a](#); [Martin, Fink, Laine, & Ayala, 2004b](#); [Martin & Laine, 2000](#); [Renvall, Laine, Laakso, & Martin, 2003](#)). The CP technique includes cycles of repeating and naming items in different contextual conditions, including semantic condition in which items are only semantically

related, phonological condition in which items are only phonologically related, and an unrelated (baseline) condition in which items are neither semantically nor phonologically related to each other. The first two relatedness conditions are aiming at the main stages of word production.

One of the aims of the present and the other recent CP studies is to determine whether it is better to treat a deficit directly or to use preserved abilities to improve lexical access. This issue has gained much interest in the field of anomia treatment (see e.g., [Nickels, 1997, 2002](#); [Nickels & Best, 1996](#)) and has sparked a growing body of carefully designed treatment studies targeting this question (e.g., [Bastiaanse, Bosje, & Franssen, 1996](#); [Drew & Thompson, 1999](#); [Hickin, Herbert, Best, Howard, & Osborne, 2002](#); [Hillis & Caramazza, 1994](#);

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Marshall, Robson, Pring, & Chiat, 1998; Nettleton & Lesser, 1991). However, there is yet no conclusive evidence of interactions between the nature of the naming deficits (semantically or phonologically based) and the effects of treatments that target specifically semantic or phonological processing. Sometimes it is difficult to ascertain the precise mechanisms by which the observed effects of a treatment have been achieved (Nickels & Best, 1996). Here, we report a study that is part of an ongoing investigation of possible treatment–deficit interactions. We will use the CP technique of priming by repeating a group of target words, but varying the relationship among the words (semantic, phonological, and no relation). This feature of the technique, along with use of a well-defined model as a framework allows us to draw conclusions about why and at which level observed effects occur.

Employment of repetition and semantic/phonological contexts in the CP technique is by no means a totally new approach. Repetition is widely used in almost all speech therapy tasks, and it has been studied by Weigl (1961), who used the so called ‘de-blocking’ technique, and more recently by Nettleton and Lesser (1991) and Miceli, Amitrano, Capasso, and Caramazza (1996). In these and other studies, repetition has been combined with other phonologically based methods of stimulating word retrieval, such as phonological cueing and reading aloud, as well as semantically based methods such as word-to-picture matching and producing semantic features and synonyms (e.g., Basso, Marangolo, Piras, & Galluzzi, 2001; Best, Howard, Bruce, & Gatehouse, 1997; Greenwald, Raymer, Richardson, & Rothi, 1995; Hillis, 1991, 1998; Hillis & Caramazza, 1994; Raymer, Thompson, Jacobs, & Le Grand, 1993). Other studies have concentrated on tasks tapping primarily the semantic level processing (e.g., Coelho, McHugh, & Boyle, 2000; Kiran & Thompson, 2003; Visch-Brink, Bajema, & Van De Sandt-Koenderman, 1997). The CP technique combines repetition and naming contexts in a way that each participant gets both semantic and phonological level treatment in a more or less implicit fashion. Still, as we will argue later in this section, it is possible to detect the separate effects of the semantic and phonological priming as they are contrasted to the condition in which there is no relation among words being trained.

The locally interactive models such as that of Dell (1986); Dell and O’Seaghdha (1992); Martin, Dell, Saffran, and Schwartz (1994); Dell, Schwartz, Martin, Saffran, and Gagnon (1997); Foygel and Dell (2000) serve as a framework for the CP technique. According to these models, lexical retrieval is expected to involve two steps (lexical-semantic and lexical-phonological) in a network consisting of three layers of nodes (semantic features, words, and phonemes). These models assume that activation spreads among the related semantic and phonological nodes and that all more or less active

lexical-semantic representations become also phonologically encoded. Moreover, the connections between the layers are not only one-way but bidirectional and excitatory. Based on these basic features of the models, it is possible to explain, for example, why normal adults make more mixed semantic-phonological errors than would occur by chance (see Martin, Weisberg, & Saffran, 1989). Similarly, as we will explain next, it can be understood why both semantic and phonological relatedness can have effects on aphasic speakers’ naming.

The facilitation of naming in the CP treatment is expected to arise from two sources explained by the aforementioned two-step interactive models (Dell, 1986; Dell & O’Seaghdha, 1992; Dell et al., 1997; Foygel & Dell, 2000; Martin et al., 1994). The first source of facilitation is repetition priming which has been shown to have long-lasting effects in word production (for normal adults see, e.g., Cave, 1997, for anomic patients see, e.g., Davis & Pring, 1991; Miceli et al., 1996). Repetition of words is assumed to increase the activation levels of the corresponding word forms and thus help in retrieving those items. The other sources of facilitation are the semantic and phonological priming effects. This facilitation mediates activation spreading amongst the related items in a picture set, and represents a fundamental feature of the interactive word-production models. Based on the models, the target items are assumed to activate several meaning-related items which share partly overlapping semantic features. The semantic activation in turn feeds forward to corresponding lexical nodes. Continuous feedforward–feedback activation between semantic and lexical nodes serves to strengthen the semantic relatedness effect so that the target and its semantic competitors have higher activation levels than items that are not semantically related to targets. This is why the items in the semantic contexts are assumed to become more available in the CP treatment. In the phonological contexts, the activation boost stems from shared sublexical representations which feed back activation to the corresponding lexical nodes. The repeated feedforward–feedback activation cycles increase activation levels of the target and its phonological competitors. Thus, the activation boost amongst related items via activation spreading may help an aphasic individual to name the pictures in both semantically and phonologically related sets better than those in an unrelated set.

In addition to the direct facilitation effects, i.e., the increased number of correct naming responses, spreading activation also brings related nontarget representations closer to the selection threshold and can give rise to contextual errors (word substitution errors within a picture set) and noncontextual errors (semantically or phonologically related word errors from outside the target set). We have observed these errors in prior CP studies although in some patients they are very rare

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