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The use of a modified semantic features analysis approach in aphasia

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ABSTRACT

Several studies have reported improved naming using the semantic feature analysis (SFA) approach in individuals with aphasia. Whether the SFA can be modified and still produce naming improvements in aphasia is unknown. The present study was designed to address this question by using a modified version of the SFA approach. Three, rather than the typical six, features were used, and written along with verbal responses were allowed in an individual with both aphasia and apraxia of speech. A single-subject multiple-baseline design across behaviors was used to treat naming of single objects across three different semantic categories in a 72-year-old individual with aphasia and apraxia of speech. Stimulus generalization of training was measured by using photographs of trained items presented in natural contexts. Training of the three different categories resulted in improved naming. At a 6-week follow-up session, naming remained above pre-treatment levels but declines were noted compared to treatment levels. Generalization to the same trained items presented in different contexts was also demonstrated although declines in performance were also noted over time. Results of the study provide qualified support for the use of three features in promoting long-term improvement of naming in an individual with both aphasia and apraxia of speech. Future SFA studies should focus on whether it is the number or types of features used, aphasia severity, or length of treatment that are critical factors in rehabilitating naming deficits in aphasia.

Learning outcomes: The reader will be able to (1) Increase understanding of the SFA approach. (2) Increase understanding of strengths and weaknesses of this approach. (3) Determine how the SFA can be modified for use in clinical settings.

1. Introduction

Within the context of word production models, naming involves the activation of at least a semantic processing level and phonological processing level(s) (e.g., Caramazza, 1997; Dell, Schwartz, Martin, Saffran, & Gagnon, 1997; Goldrick & Rapp, 2007; Levelt, Roelofs, & Meyer, 1999; Starreveld & La Heij, 1996). Although the degree of temporal interactivity between the processing levels remains a source of debate, the processing levels specified in these models have provided the framework from which to examine naming errors. The fact that both semantic and phonological processes are activated during the course of naming means that deficits can arise from incomplete, inaccurate, or lack of activation of representations at the semantic processing level, phonological processing level(s), links between the levels, or both processing levels (see Howard & Gatehouse, 2006; Wilshire, 2002; Wilshire & Coslett, 2000; Wilshire & McCarthy, 1996, for reviews distinguishing between different aphasic naming error types).

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Given the pervasiveness of dysnomia in aphasia, treatment approaches that aim to improve naming deficits are of the utmost importance for individuals with aphasia as well as for those who communicate with them. It is not surprising, given the centrality of semantic knowledge to picture naming, that many naming treatment approaches incorporate techniques that seek to improve representations within the semantic proccesing level. One of the most common approaches is the semantic features analysis (SFA) approach, which focuses on strengthening the semantic features of the targeted picture in order to facilitate naming of the picture name (Boyle, 2004; Boyle & Coelho, 1995; Coelho, McHugh, & Boyle, 2000; Conley & Coelho, 2003; Haarbauer-Krupa, Moser, Smith, Sullivan, & Szerkeres, 1985; Lowell, Beeson, & Holland, 1995; Massarro & Tompkins, 1994). In this approach, pictures are presented for naming. Regardless of the success in naming the target picture, semantic features associated with the target are presented, which are written on a worksheet in boxes that surround a targeted picture placed in the middle of the sheet.

The theoretical underpinning this approach is based on the notion of spreading activation within the semantic system (Collins & Loftus, 1975). The semantic processing level is conceptualized as a network of semantic representations and links that are interconnected to other related representations. Semantic representations that have many shared properties will be linked more closely compared to representations that have minimal or no shared properties. The presentation of features that are strongly related to the targeted picture results in spreading of activation that converges onto the target concept, which receives a higher level of activation compared to other similar concepts. The targeted concept then activates the phonological information associated with it so that the target word is produced. Thus, the rationale underlying the SFA approach is to re-learn or learn a strategy of activating strongly associated features, which will facilitate naming of the targeted picture.

In previous SFA studies (Boyle, 2004; Boyle & Coelho, 1995; Coelho et al., 2000; Conley & Coelho, 2003; Lowell et al., 1995; Massarro & Tompkins, 1994), the feature types used in this approach have included: group ("X is a _____"), properties ("X has/is _____"), function ("X is used for/to ____"), location ("X is found _____"), action ("X does what?"), and association ("X reminds me of ____"). However, the rationale for using these particular features has not been discussed. Presumably, these features represent most of the attributes of a particular semantic concept, resulting in raising the activation level of the targeted lexical concept high enough for retrieval to occur. However, as Boyle (2004) states, certain features are not as applicable for certain concepts (e.g., the feature of action does not readily elicit a response for the target, *apple*); in those cases, only features deemed appropriate for the stimulus item are provided.

Studies using the SFA approach have reported improved naming of trained and untrained items across aphasia types (Boyle, 2004; Boyle & Coelho, 1995; Conley & Coelho, 2003; Coelho et al., 2000; Lowell et al., 1995). Presumably, generalization to related but untrained words occurs because there has been activation of features that are shared with the trained set. Generalization beyond untrained but similar words, however, has been less than compelling. Although both participants in Boyle's (2004) study demonstrated generalization from treated nouns to untreated nouns, only certain discourse measures improved after treatment: Participant 1 became more efficient in providing relevant, accurate information as evidenced by increased correct information units (CIUs) per minute, as well as significantly fewer instances of word retrieval delays, while Participant 2 demonstrated increased CIUs (although non-CIU words also appeared to have increased). Coelho et al. (2000) reported that their participant provided more relevant information by the time treatment ended as evidenced by "modest" increases in CIUs per minute compared to baseline levels. However, Boyle and Coelho (1995) did not find any generalization to discourse when using CIUs as the discourse measure. Thus, of the three investigations that used discourse measures as a means of measuring stimulus generalization, two studies reported some generalization (Boyle, 2004; Coelho et al., 2000), while one reported no generalization at all (Boyle & Coelho, 1995).

Although semantic features treatment studies have been implemented across a variety of aphasia types, the inclusion of participants with aphasia and apraxia has been limited. The Boyle and Coelho (1995) study employed the SFA approach in an individual with mild, nonfluent aphasia and a mild apraxia of speech. The participant, HW, demonstrated improved naming of trained items and untrained items as well as maintenance of trained items, but as stated above, no generalization to connected discourse was found. Kiran (2008) examined the naming abilities in two participants (P4, P5) with a diagnosis of Broca's aphasia and mild-moderate apraxia using an approach where the degree of typicality of category members served as a basis for treatment (Kiran & Thompson, 2003). For P4, no improvements in naming were demonstrated until he was allowed to write his responses. In the case of P5, no significant improvements were noted even when allowed to write responses. Naming improved significantly only when P5 was provided initial phonemic cues along with the ability to write responses. Thus, it appears that individuals with nonfluent aphasia and apraxia demonstrate gains in naming but only when written responses supplement oral/verbal responses.

The findings from the studies reviewed above can be summarized as follows: Typically, SFA studies use six selected features to highlight various attributes of a given targeted lexical concept; as Boyle (2004) points out, however, a given feature is not provided if it is not relevant or applicable. Studies using the SFA approach have reported improved naming of trained items due to a re-learning of a strategy, via feature cues, to facilitate word retrieval (Coelho et al., 2000). Improved naming of untrained but related items has also been reported, presumably because shared features have been activated during course of treatment. However, stimulus generalization to behaviors such as discourse has not been consistently reported. The approach has benefited individuals with either nonfluent or fluent aphasia; whether it is appropriate for individuals with other related deficits, such as apraxia of speech, is largely unknown since so few studies have used it to treat these types of individuals.

The purpose of the study, therefore, was to determine if implementing a modified version of the SFA in an individual with nonfluent aphasia and apraxia would result in improved naming of trained items. The first modification was the use of three, rather than the standard, six features. Although the rationale for the use of six features is not specified in SFA studies, there is