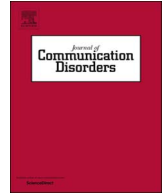


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Research paper

Effects of semantic weight on verb retrieval in individuals with aphasia: A different perspective



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ABSTRACT

The majority of people with aphasia have word retrieval difficulty and effective treatment remains elusive. There have been a few studies that have explored the effects of semantic complexity on verb retrieval in individuals with aphasia; each used a variation of Breedin et al.'s (1998) delayed repetition/story completion task. Although each subsequent investigator worked to address potential confounds in order to achieve more valid results that would give rise to a clearer understanding of these deficits, findings and their interpretations have varied. In our replication, groups of individuals with aphasia (9 agrammatic and 9 anomic) plus 12 age-matched controls participated in a story completion task that included novel distracter stories to prevent rehearsal. Additionally, stimuli were developed in strict adherence to novel semantic and syntactic templates to control for relevant factors, and stimuli were prerecorded to ensure uniform delivery. We calculated the number of target verbs produced and overall production of light and heavy verbs, and error analysis was performed with special attention to semantically appropriate substitutions. In contrast to previous studies, we found no significant performance differences on these measures within or between groups. Exploratory analyses were performed. Results are discussed in terms of relevant factors of verb retrieval and implications for future experimental design. Application to much-needed verb retrieval treatment is also considered.

1. Introduction

It is estimated that 1,000,000 people in the United States alone have aphasia and that 100,000 new cases will be added each year (National Aphasia Association, 2009). The majority of people with aphasia have word retrieval difficulty (Goodglass & Kaplan, 1983) that interferes with daily communication and often adversely affects overall quality of life (Best, Greenwood, Grassly, & Hickin, 2008; Chapey, 2001; Cruice, Worrall, & Hickson, 2006). Those with fluent anomic aphasia have more difficulty retrieving and producing nouns than individuals with nonfluent agrammatic aphasia, who have more difficulty with verbs, although this dissociation is not absolute (Berndt, Mitchum, Haendiges, & Sandson, 1997; Caramazza & Hillis, 1991; Kim & Thompson, 2000; Luzzatti et al., 2002; Luzzatti, Aggujaro, & Crepaldi, 2006; Miceli, Silveri, Villa, & Caramazza, 1984). Agrammatism is further marked with syntactic difficulties, often centering on verbs. It is likely that both syntactic and semantic factors affect lexical access to verbs. For example, it has been hypothesized that individuals with agrammatism may have more difficulty retrieving and producing semantically light verbs because of the role that light verbs play in syntax. By contrast, individuals with agrammatism may have greater capacity with semantically heavier verbs that rely more heavily on the intact semantic system (Barde, Schwartz, & Boronat, 2006; Gordon & Dell, 2003; Thorne & Farqi-Shah, 2016).

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Semantic aspects of noun deficits in aphasia (Cuetos, Aguado, & Caramazza, 2000; Goodglass, Klein, Carey, & Jones, 1966; Lambon Ralph, Sage, & Roberts, 2000; Mahon & Caramazza, 2009; Shapiro & Caramazza, 2001) have been studied extensively. Semantic noun treatments have derived from such studies, based on theories of the lexical-conceptual structure of nouns in the mental lexicon. Semantic factors affecting verb usage in aphasia have received minimal attention in scientific inquiry (Barde et al., 2006; Breedin, Saffran, & Schwartz, 1998; Gennari & Poeppel, 2003; Gordon & Dell, 2003; Kim & Thompson, 2004; Marcotte et al., 2014; Thorne & Faroqi-Shah, 2016) and semantic verb treatments are scarce (Edmonds, Nadeau, & Kiran, 2009; Faroqi-Shah & Graham, 2011). Understanding how verbs are semantically organized in the mental lexicon could provide a basis for refining and developing therapies aimed at accessing words within that organized system. This study explored the effects of the semantic complexity of verbs on retrieval in individuals with aphasia, hoping to gain a better understanding of the lexical-conceptual structure of verbs in the mental lexicon.

1.1. Background

1.1.1. Theories of the semantic complexity of verbs

The decomposition theory of verbs (Jackendoff, 1991; Pinker, 1989) holds that a limited set of core primitive predicates (e.g., *go*) combines with semantic features (e.g., *thing*, *manner*) to represent a verb. For example, the verb *run* can be decomposed into the core *EVENT* predicate *go*, combined with the going *manner* (*at a fast pace*) and the going *thing* (agent: *runner*). In this view, core primitives or *light* verbs, such as *go*, occur as a component of the meaning of other verbs, such as *run*. Verbs that contain light verbs in their meaning and combine with semantic features that render their meanings more specific are *heavy* verbs. Heavy verbs naturally occur much less frequently than light verbs.

In addition to semantic features of the verb itself (e.g., *manner* feature), the semantic feature *thing* is the associated verb *argument* (i.e., noun fulfilling a thematic role in a verb phrase) as required by the verb's argument *structure* (i.e., the *set* of verb arguments required by the meaning of the verb, such as the necessity of a noun *thing* to *go* or *run*). The verb argument structure sets forth semantic (*selectional*) *restrictions* on the semantic features of the nouns that can appropriately fill thematic roles (such as the appropriate semantic features associated with those *things* that can *go* or *run*). More specific verbs select more specific verb arguments.

Jackendoff (1991) theorized that selectional restrictions are an integral part of a verb's meaning, such that even in the absence of the noun phrase itself, the set of semantic features appropriately selected for the verb argument are still included in the meaning of the verb. More recently, McCrae and Jones (2013) highlighted the importance of verb arguments in semantic representation and supported this theory by demonstrating that verb arguments prime verbs (McRae, Hare, Elman, & Ferretti, 2005). In sum, the semantic feature complexity of verbs is comprised of both a) semantic features of the verb itself, and b) semantic features of verb arguments (i.e., nouns associated with a verb as part of its meaning).

1.1.2. Prior story completion tasks

To explore the effects of semantic complexity on verb retrieval in individuals with aphasia who demonstrated poorer verb than noun production, Breedin et al. (1998) used a story completion with delayed repetition task. Pairs of three-sentence stories were created containing either a light/general or heavy/specific verb (e.g., story about a grandmother who "*made* or *baked* a wonderful dessert"). Participants heard the experimenter deliver the story with one of the two verbs, and then were asked a question (e.g., "*What did grandmother do?*") designed to elicit the light/general or heavy/specific verb from the story. Because there were explicit instructions to *use words from the story*, this was considered a repetition task. Because there was an intervening sentence between the one containing the target verb and the elicitation question, the task was considered delayed. The filled delay was designed to prevent rehearsal and therefore promote true verb retrieval. However, delay without an interfering task does not necessarily preclude rehearsal (Berman, Jonides, & Lewis, 2009).

Six of the eight participants not only retrieved a larger portion of the semantically heavier verbs, but also substituted more heavy/specific verbs for light/general verb targets. The authors speculated that heavy/specific verbs were easier to retrieve because they are specified by more semantic features and because they are less variable in the contexts (i.e., the possible set of associated verb arguments) in which they can occur. They reasoned that light/general verbs, on the other hand, were more difficult to retrieve because they require fewer semantic features and thereby occur in many more contexts.

Yamada (2001) pointed out that low frequency words (such as heavy/specific verbs) are more salient and therefore, more likely to be immediately *recognized* and less likely to be *recalled* (retrieved). He contended that the Breedin et al. (1998) story completion task was one of *recognition* (a working-memory task involving implicit semantic processing) not *recall* (a long-term memory task involving explicit semantic processing; Rissman, Eliassen, & Blumstein, 2003; Ruff, Blumstein, Myers, & Hutchison, 2008). Breedin and Saffran (2001) responded to Yamada by noting that their task had components of both recognition and recall. They hypothesized that individuals with agrammatic aphasia may have experienced light verb retrieval difficulty because high-frequency light verbs are strongly linked to syntactic structures, which are weakly represented in agrammatism.

Barde et al. (2006) replicated the Breedin et al. (1998) story completion with delayed repetition experiment, comparing performance in individuals with agrammatic and non-agrammatic aphasia with that of an age-matched control group. True to their predictions, the agrammatic group produced more heavy verbs. Both the non-agrammatic and age-matched control group produced heavy/specific verbs on par with their light/general verb counterparts. Barde et al. (2006) concluded that this demonstrated that individuals with agrammatic aphasia have a decrement in light verb performance. However, as in the original story completion task (viz., Breedin et al., 1998), it is possible that performance differences centered more on differences in the ability to recognize, rehearse and repeat heavy verbs, than on differences in ability to *retrieve* light/general versus heavy/specific verbs.

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