Semantic Knowledge Use within Discourse Produced by Individuals with Anomic Aphasia

Introduction

According to the feature-specific model (Cree & McRae, 2003), semantic knowledge is a distributed network of features that are stored separately and can be impaired separately. These semantic features are the building blocks of the semantic knowledge system and of concepts in general. This has led researchers to using semantic features-based treatments to improve word retrieval abilities in adults with anomic aphasia. Semantic features-based treatments have been used to improve the ability for individuals with aphasia to re-establish connections between the semantic and lexical systems. Researchers have found that semantic features-based treatment, are typically successfully in improving verbal production abilities in adults with aphasia at the word level (Kiran & Roberts, 2010) and discourse (Boyle, 2004; Peach & Reuter, 2010; Rider, Wright, Marshall, & Page, 2008).

Recently, researchers have examined the utility of semantic features-based treatment for improving discourse production in adults with aphasia; however, few researchers have examined *how* the semantic knowledge is used within discourse. Armstrong (2001) examined the lexical patterns of verbs in discourse samples given by four participants with aphasia (PWA) and four healthy participants. Armstrong categorized verbs from personal recounts into one of five semantic-lexical categories (material, relational, mental, verbal, and behavioral). She found that PWA presented with different verb patterns that resulted in restricted communication. Moreover, the PWA had produced few mental and relational verbs. However, Armstrong included only lexical-semantic categories and they are connected by semantic relationships and possibly also grammatical relationships. To expand our knowledge of the appropriateness of using semantic features-based treatments at the discourse level, it important to understand how semantic knowledge is used beyond simply allowing access to lexical items. Unknown is if semantic knowledge use differs in adults with aphasia compared to cognitively healthy adults. These findings could have significant implications for how to apply semantic features-based treatments to improve discourse level abilities in adults with aphasia.

To this end, the purpose of the study, then, was to determine if the semantic knowledge and category types used in discourse by participants with anomic aphasia differed from those used by cognitively healthy participants. Certain semantic knowledge types and category types may be more difficult to access, integrate, or maintain in discourse for adults with anomic aphasia because producing discourse is cognitively demanding and requires processes external to lexical and semantic access. Therefore, we hypothesized that the discourse produced by participants with anomic aphasia would differ in the proportion of semantic knowledge and category types used.

Method

Participants. Language samples from 38 adults, 19 participants with anomic aphasia (10 female) and 19 healthy participants (10 females), from AphasiaBank, an online shared database that collects and analyzes digital recordings of discourse across a series of tasks were included in the study. The groups were matched for age and education. The mean age for the aphasia group

was 62.74 (SD=13.90), and the mean age for the control group was 62.95 (SD=14.25). The PWA reported a mean of 15.79 (SD=2.92) years of education, and the healthy participants reported a mean of 16.21 (SD=2.97) years of education. All participants met the following criteria: (a) no reported history of psychiatric or neurodegenerative disorders; (b) aided or unaided normal hearing acuity; (c) corrected or uncorrected normal visual acuity; and (d) English as their primary language. Participants with anomic aphasia also met the following criteria: (a) aphasia secondary to a unilateral left hemisphere stroke as determined by the Western Aphasia Battery-Revised (Kertesz, 2007) and (b) chronic aphasia (minimum = 6 months post onset).

Stimuli & Instructions. Language samples consisted of a story retell task designed to elicit narrative discourse. Participants retold the story of Cinderella.

Transcription and Language Samples. Language samples were digitally recorded and then orthographically transcribed in the CHAT format that is compatible with a set of programs called Computerized Language Analysis (CLAN, MacWhinney, 2000). Finally, the samples were segmented into c-units, which is an information unit that includes an independent clause with its modifiers (Loban, 1976).

Semantic Knowledge Coding. A coding system was used that was based and then expanded on previous single concept work by Cree and McRae (2003) and McRae et al. (2005). The system included 10 semantic knowledge types. These semantic knowledge types included seven sensory items: visual-color, visual parts and surface, *visual motion, smell, sound, tactile, and taste*. The other knowledge types included *function* that represents how people use and interact with tools, objects, and concepts; *encyclopedic* knowledge that includes facts, location, relationships, and time; and *internal* knowledge that includes desires, goals, and emotions. Nouns were also coded as either *living* (e.g. plants or animals) or nonliving (abstract ideas, locations, or objects).

The semantic knowledge types were coded in CLAN by expanding the error tag system. For each transcript, coders took the c-units and broke them into phrases. The content words (nouns, verbs, adjectives, and –ly adverbs) of the phrases were either grouped together if they corresponded to one knowledge type or separated if the words added semantic information that could correspond to different knowledge types. Finally, the semantic units were coded with one of the ten semantic knowledge types, and nouns were also coded as *living* or *nonliving*. This was done for all 38 discourse transcripts. Ratios of semantic knowledge were produced by dividing each semantic knowledge type by the total number produced.

Preliminary Results and Discussion

Preliminary analyses were conducted to determine if groups differed in vocabulary diversity. Differences in vocabulary could result in differences in semantic knowledge presented during discourse. *Vocd* was used as the measure of vocabulary diversity (Fergadiotis & Wright, 2011). A paired sample t-test was conducted and results indicated no significant differences between *vocd* scores, $t(18)=-1.262$, $p=.223$. Therefore, vocabulary differences were not considered in the remaining analyses.

To address the main aim of this study of whether semantic knowledge and category types differed between the two groups, a Wilcoxon Signed-ranks test was conducted between groups for the 10 semantic knowledge types. To correct for type I error, a Bonferroni correction was used ($\alpha=.05/10=.005$). The groups did not differ significantly for any of the semantic knowledge

types. A Wilcoxon Signed-ranks tests were also conducted between groups for category types (living and nonliving). The results were not significant for either category, living, Z=-.604, p=.546 or nonliving, Z=-.604, p=.546, indicating no difference between the two groups for proportion of category types used.

These preliminary results demonstrate that participants with anomic aphasia and healthy participants are able to use macro-level semantic knowledge types and categories similarly within discourse. The participants with anomic aphasia, then, may have preserved semantic knowledge despite word retrieval difficulties. Our findings support Martin et al.'s (1999) research where they found preserved semantic systems for nonverbal concepts but deficits in lexical items in participants with anomic aphasia. Our hypothesis was not supported by the results. The findings may support the theoretical basis for semantic features-based treatment that production can be improved by re-establishing connections between the semantic system and the lexicon. Results will be discussed within a theoretical framework of semantic knowledge and clinical implicated will be considered.

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