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Distinctive versus Common Feature Knowledge across Three Levels of Importance: Relationship with Word Retrieval Performance in People with Aphasia

Semantic Feature Analysis (SFA) is a well established intervention technique for improving word retrieval in people with aphasia. This technique uses features of target words to activate semantic networks and thereby improve word retrieval as supported by the spreading activation theory of semantic processing (Collins & Loftus, 1975). Variations of this intervention technique have been successful at improving word retrieval of some people with aphasia (e.g., Boyle, 2004; Coelho, McHugh, & Boyle, 2000; Peach & Reuter, 2010; Wambaugh & Ferguson, 2007). As part of an effort to increase the effectiveness of semantic treatments such as SFA, semantic feature knowledge of people with aphasia has been examined in depth (Cox, 2009; Germani & Pierce 1995; Mason-Baughman, 2009; Mason-Baughman, 2010; Vecchi, 1994). For purposes of this research, feature knowledge refers to the ability to identify that a feature belongs to a particular target word during a sorting task as described below. To develop understanding of the semantic knowledge of people with aphasia, researchers have primarily examined two aspects of features: importance and distinctiveness.

Feature importance has been defined as the degree to which features are frequently identified with a concept (Hampton, 1979). High importance features are those that are most often identified with a concept. Mid-importance features are those sometimes identified with a concept; low importance features are rarely identified with a concept. Hampton (1987; p. 68) provides this example: VEHICLE: "is for transportation" rated as high importance, "is noisy" rated as low importance. Investigations of feature knowledge in people with aphasia found the greatest accuracy in identification of high-importance features, and lower accuracy for identification of low-importance (Germani & Pierce, 1995) and mid-importance features (Cox, 2009).

Another important aspect of feature knowledge, distinctiveness, has been identified as the number of concepts that share a given feature. An example provided by Tyler and Moss (2001) for the concept "cow" indicates "has udders" as a distinctive feature, and "has eyes" as a common feature. Mason-Baughman (2010) found that people with aphasia demonstrated difficulty identifying low importance distinctive (LID) features compared to high importance distinctive (HID) features.

Relationships among knowledge of features varying in levels of importance, and standardized measures of naming ability have been examined (Germani & Pierce, 1995; Cox, 2009; Mason-Baughman, 2009). Related to importance and distinctness, Mason-Baughman (2010) found significant correlations between LID feature knowledge and the *BNT-2* ($r = .79$). Because of variability among previous results, further investigation of these relationships is warranted.

The purpose of this repeated measures study was to examine the relationship between distinctive feature knowledge and word retrieval performance in people with aphasia.

Participants

Twelve people with chronic aphasia participated in this study. All participants reported adequate hearing and visual acuity to participate in experimental tasks; and passed a single word level reading comprehension screening task. Aphasia Quotients (AQ) computed from

administration of the *Western Aphasia Battery-Revised* (WAB-R) (Kertesz, 2006) documented the severity and type of each participant's communication impairment.

Table 1 contains participants' demographic information including age, gender, time post onset, years of education, type of aphasia, and scores from standardized tests.

Stimuli

Target Words. Potential target words were selected from 27 low (<8/million) and mid (10-25/million) frequency words used in previous research (e.g., Germani & Pierce, 1995) and taken from Francis and Kucera's (1982) word frequency list. Participants completed an auditory matching task to determine 21 target words to be used for experimental sessions. Colored line drawings representing target words were placed on index cards for use during experimental tasks.

Features. Each potential target word had six features, one of each type (i.e., HIC, HID, MIC, MID, LIC, LID). Importance ratings were identified in previous research (Germani & Pierce, 1995). Twenty adults without neurological or language disorders completed a questionnaire to determine distinctive and common ratings for the features related to potential target nouns. The results of this questionnaire were consistent with similar surveys (Mason-Baughman, 2009; 2010). Features and potential target words were printed on index cards.

Procedures

Session One. Participants completed two single word subtests (i.e., I and II) of the *Reading Comprehension Battery of Aphasia-2 (RCBA-2)* (LaPoint & Horner, 1998). Participants had to achieve a score of 9/10, ensuring that reading comprehension difficulties would not interfere with completion of experimental tasks. Participants also completed the AQ portion of the *WAB-R.* Participants finished two word retrieval tasks during the first session: confrontation and descriptive naming. Both tasks included some or all of each participant's 21 target words.

Session Two. Each participant completed the sorting task with all 21 target words (i.e., 7 trials of the sorting task with 24 features each). For every trial, participants placed each of the 24 feature cards on one of three index cards with printed target nouns arranged horizontally in front of each participant or on a fourth *unrelated* card. Features included one of each of the six types (i.e., HIC, HID, MIC, MID, LIC, LID) for each target word and six features unrelated to the 3 target words.

Other tasks completed during session two included standardized tests: the *BNT-2* and the *TAWF brief test.* Additionally, participants completed two divergent naming tasks (i.e., animals and foods). Tasks were systematically presented during both sessions to ensure that participants did not consecutively complete tasks involving target words to control for priming effects on task performance.

Data Analysis

The researchers performed correlations between common and distinctive feature knowledge across levels of importance and accuracy during confrontation, divergent, and descriptive naming tasks, as well as *TAWF brief test* and *BNT-2* scores.

Results

Significant correlations were demonstrated between confrontation naming scores and sorting abilities for MID and LID features. Additionally, significant correlations were shown between descriptive naming and sorting abilities for HID, MID, LID, and MIC features. The *TAWF brief test* score had significant correlations with many feature types including HID, MID, LID, MIC, and LIC features. Finally, the *BNT-2* was correlated with all features types. The correlation matrix is available in Table 2.

Discussion

The results of the current study are consistent with previous research showing that word retrieval ability correlates with feature knowledge, and in particular, LID feature knowledge (Germani & Pierce, 1995; Mason-Baughman, 2010). Specifically, current results show that the *BNT-2* correlated with LID feature identification ($r = 0.718$).

The current study also extended this area of research. First, the researchers found significant correlations between LID feature knowledge and performance on the *TAWF brief test*, and the confrontation and descriptive naming tasks. Second, the researchers found that MID feature knowledge was significantly correlated with performance on all three word retrieval tasks and standardized measures of word retrieval. In contrast, HIC feature identification only correlated with performance on one measure of naming ability, the *BNT-2* score.

Together these results indicate that distinctive feature knowledge has a stronger correlation with word retrieval abilities than common feature knowledge. Additionally, low and mid importance feature knowledge is correlated with word retrieval abilities more than high importance feature knowledge. Because of these correlations, semantic feature treatments that emphasize distinctive features of low and mid importance may result in the greatest improvements in the word retrieval abilities of people with aphasia.

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Table 1

Participant Demographic Data and Aphasia Type and Severity

Participant	Age (years)	Gender	Time post-stroke (months)	Education level (years)	*WAB-R* classification	*WAB-R* Aphasia Quotient	*TAWF (Brief Test)*	*BNT-2*	*RCBA-2 Subtests I, II.*
1	39	M	96	16	Broca's	55.4	6	19	19
2	48	M	38	14	Broca's	57.4	10	21	19
3	48	F	63	12	Broca's	58.9	8	11	18
4	68	M	15	16	Wernicke's	50.3	0	1	19
5	42	F	13	14	Anomic	94	36	50	20
6	86	M	82	12	Anomic	79	26	49	20
7	58	M	27	13	Wernicke's	46.5	0	2	18
8	64	M	140	14	Anomic	83.8	20	43	19
9	72	F	38	18	Anomic	93	33	59	20
10	52	M	42	12	Conduction	66.6	20	44	20
11	66	M	61.2	14	Transcortical Motor	46.2	18	4	19
12	70	M	16	12	Wernicke's	16.75	0	1	18

Table 2

Correlations among Participants' Feature Knowledge and Word Retrieval Performance

	Confrontation Naming	Descriptive Naming	Divergent Naming Animals	Divergent Naming Foods	TAWF brief score	BNT-2	HID	MID	LID	HIC	MIC	LIC
Confrontation Naming	----	.896**	.729**	.665*	.761**	.871**	.564	.815**	.696*	.437	.568	.430
Descriptive Naming	----	----	.667*	.681*	.799**	.910**	.734**	.826**	.796**	.486	.648*	.478
Divergent Naming Animals	----	----	----	.929**	.835**	.822**	.341	.641*	.479	.373	.451	.526
Divergent Naming Foods	----	----	----	----	.821**	.831**	.464	.617*	.534	.523	.509	.713**
TAWF brief score	----	-----	----	----	----	.891**	.688*	.876**	.730**	.557	.657*	.674*
BNT-2	----	-----	----	----	----	----	.728**	.864**	.718*	.612*	.637*	.634*
HID	----	-----	----	----	-----	---	----	.853**	.847**	.824**	.822**	.598*
MID	----	-----	----	----	-----	---	----	----	.873**	.657*	.784**	.533
LID	----	-----	----	----	----	-----	----	----	----	.648*	.880**	.577*
HIC	----	-----	----	----	----	----	----	----	----	----	.727**	.748**
MIC	----	-----	----	----	----	----	----	----	----	----	----	.672*
LIC	----	-----	----	----	----	----	----	----	----	----	----	----

** correlation is significant at $p < 0.01$ level

* correlation is significant at $p < 0.05$ level