The effect of word familiarity and treatment approach on word retrieval skills in aphasia

Research is extremely limited relative to investigations examining how familiarity of stimuli affects an aphasic individual's word retrieval skills. Current word retrieval treatments often do not manipulate the familiarity of the stimuli. As familiarity is a variable that affects word retrieval in aphasia (Davis, 2007; Goodglass, 1993; Goodglass, Kaplan, & Barresi, 2001), it is valuable to examine how this factor impacts improvement in treatment itself. Furthermore, it is unclear how word familiarity affects word retrieval skills relative to specific treatments such as Phonological Components Analysis (PCA) (Leonard, Carol, Rochon, et al., 2008) and Semantic Feature Analysis (SFA) (Boyle, 2004), regardless of the basis of the individual's retrieval deficit. The purpose of the current investigation was to examine the effect of subjective familiarity on an aphasic individual's word retrieval skills and ability to improve in short, intensive treatment.

Method

Participants

Four male participants were recruited for this study. All were native English speakers, right-handed, with aphasia resulting from left-hemisphere brain-damage. All earned at least a high school diploma and were at least three months post-onset CVA. A questionnaire requesting duration and extent of relationship between participant and caregiver (>/= 1 year), education level, profession, race, and months post-onset CVA, of each participant was completed by the participant and/caregiver (Table 1).

All participants passed a hearing screening through the speech frequencies, a modified version if over age 50 (Ventry & Weinstein, 1983; 1992). All participants were administered the *Test of Adolescent/Adult Word Finding (TAWF)* (German, 1990) and the *Western Aphasia Battery-Revised (WAB-R)* (Kertesz, 2007) if it was not administered to them within the last 2 months.

The individuals with aphasia needed to demonstrate that they could reliably rate non-experimental stimuli pictures based on their familiarity. This was assessed using one of two rating scales: a caregiver rating scale (adapted from Gilhooly & Hay, 1977; Noble, 1953) or a more participant-friendly scale (based on ASHA QCL; Paul, Frattali, Holland, et al., 2004).

Familiarity Rating

The experimental task stimuli and corresponding pictures utilized for this study originate from Rossion and Pourtois (2004), which is a colored adaptation of Snodgrass and Vanderwart's (1980) 260 black-and-white line drawings. These stimuli were used because they have been standardized for name agreement, image agreement, familiarity, and visual complexity. Caregivers rated how familiar they think their significant other is with the 260 picture stimuli prior to their onset of aphasia by viewing the pictures on a computer and checking NEVER, RARELY, SOMETIMES, OFTEN, or VERY OFTEN on a response form. Participants rated their familiarity with the 260 stimuli using the same rating scale (adapted from Gilhooly & Hay, 1977; Noble, 1953) or the more participant-friendly scale. For this latter researcher-devised scale, degree of familiarity corresponds to the number, color, and expression of faces: larger quantity of faces equates to more extreme rating of familiarity or unfamiliarity; sad faces

represent a lack of familiarity, while happy faces represent some degree of familiarity with the particular noun picture.

Picture-Naming

After rating familiarity, participants were asked to name all of them on 3 separate trials. Pictures that a participant failed to name on at least 2 out of three trials were selected as potential treatment and probe stimuli, taking familiarity rating into consideration. From these potential treatment and probe stimuli, 80 familiar and 80 unfamiliar stimuli were identified, specific to each participant. For each participant, stimuli were randomly divided into two groups of familiar and unfamiliar stimuli: eighty stimuli (40 familiar, 40 unfamiliar) for Treatment 1 and eighty stimuli (40 familiar, 40 unfamiliar) for Treatment 2. Of the 80 familiar and unfamiliar stimuli for each treatment, 40 (20 familiar, 20 unfamiliar) were identified as treatment stimuli and 40 (20 familiar, 20 unfamiliar) as probes for examining generalization. Thus, a different set of familiar and unfamiliar treatment and probe picture stimuli were addressed during each treatment phase.

Treatment 1 and 2

Prior to each treatment phase for Treatment 1 and 2 for each participant, three baseline measures were taken on 80 randomly chosen familiar and unfamiliar stimuli. Probe stimuli will be tested once during each treatment: last day of SFA and last day of PCA for all 4 patients. One month later, all 160 stimuli (familiar and unfamiliar) including treatment and probe stimuli for both Treatment 1 and Treatment 2 for each participant were presented with a second follow-up session a week later.

All participants were assigned to either SFA (Boyle, 2004) or PCA (Leonard, Carol, Rochon, et al., 2008) treatment. Participants A and B underwent SFA treatment first, followed by PCA, whereas Participants C and D had PCA treatment first, followed by SFA. All participants underwent Treatment Type 1 (SFA or PCA) for five sessions. At the end of the treatment, participants were re-administered the TAWF and WAB-R. Prior to introducing Treatment Type 2 (SFA or PCA), the three baselines were obtained on the different set of familiar and unfamiliar stimuli. Then, Treatment 2 was implemented over 5 sessions. All participants underwent the same re-testing procedures after Treatment 2 as after Treatment 1. Treatment performance data included number of accurate responses for the 40 familiar and unfamiliar stimuli daily basis for that particular Treatment condition.

SuperLab Pro's (Cedrus Corporation, 2008) was used on a laptop computer to determine accuracy and latency of responses for picture naming at baseline and follow-up data measurements for all treatment and probe stimuli. SFA treatment protocol utilized is similar to Boyle (2004). PCA treatment protocol is similar to Leonard, Carol, Rochon, et al. (2008). The PCA modeled the SFA procedure, except the clinician encouraged participants to produce words *phonologically related* to targets including what it rhymes with, its first sound, its first sound associate, its final sound, and number of syllables.

Results

Participant data was analyzed in a single-subject design format. WAB-R and TAWF data are presented in Table 2. In most cases, WAB-R AQ scores were relatively consistent throughout treatment. TAWF raw scores were more variable with Participant C showing the most consistent improvement. Word retrieval data based on treatment condition, familiarity, and probe/treatment stimuli are presented in Table 3. Review of the data revealed that all participants showed some improvement throughout treatment. Type of treatment (phonological or semantic) did not appear to influence findings for any participant. Greatest increases were observed for familiar treated stimuli for all 4 participants. Interestingly, minimal generalization was observed as indicated by performance on probe stimuli, regardless of familiarity.

Discussion

The results of this investigation support the premise that familiarity is an important variable that appears to positively influence improvement in word retrieval therapy in chronic aphasia (Davis, 2007; Goodglass, 1993), regardless of overall patient severity of impairment. Although some increases were noted in treated stimuli that were rated as unfamiliar, greatest improvement for all four participants was for familiar treated stimuli. Minimal generalization to probe stimuli was observed, regardless of stimuli familiarity.

Treatment approach, in the form of PCA or SFA, did not appear to be of consequence relative to familiarity of stimuli or any participant's improvement in treatment, regardless of the basis of their word retrieval deficit. This observation may be related to the chronicity of the linguistic deficits in this sample of aphasic individuals; however, this premise requires further exploration.

References

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Table 1. Participant demographic data

	Age	Education	Months Post-Injury
Participant A	**69**	**18**	**37**
Participant B	**56**	**18**	**28**
Participant C	**53**	**16**	**39**
Participant D	**62**	**16**	**52**

Table 2. WAB-R AQ and TAWF raw score performance throughout treatment for each participant

	Pre-Treatment		Inter-Treatments		Post-Treatment	
	WAB*	**TAWF****	**WAB**	**TAWF**	**WAB**	**TAWF**
Participant A	**33**	**38**	**34**	**40**	**37**	**39**
Participant B	**64**	**68**	**62**	**73**	**64**	**74**
Participant C	**40**	**49**	**46**	**58**	**44**	**61**
Participant D	**55**	**59**	**56**	**65**	**56**	**63**

***Aphasia Quotient**

****** Raw Score (max = 107)**

Table 3. Mean participant retrieval performance based on familiarity

	Baseline		Treatment 1		Treatment 2		Follow-up	
	Fam	Unfam	Fam	Unfam	Fam	Unfam	Fam	Unfam
Participant A								
Treatment	3	3	5	3	7	3	6	3
Probe	2	1	1	1	2	1	2	1
Participant B								
Treatment	8	6	11	7	13	8	13	7
Probe	7	6	6	5	5	5	7	6
Participant C								
Treatment	6	5	9	7	12	9	11	8
Probe	6	4	5	4	7	3	7	4
Participant D								
Treatment	9	7	12	9	14	10	14	9
Probe	7	4	6	3	6	4	7	4