PWAs AND PBJs: LANGUAGE FOR DESCRIBING A SIMPLE PROCEDURE

Abstract

The purpose of this study was to analyze responses to a simple procedural discourse task in persons with aphasia (PWAs n=141) and non-aphasic participants (n=145). Participants described how to make a peanut butter and jelly sandwich. Results showed significant differences between groups on mean length of utterance, total number of words, total number of utterances, and task duration. However, the top 10 verbs and nouns used by both groups were nearly identical and the proportion of nouns, verbs, pronouns, and determiners used by each group was similar. Aphasia severity correlated moderately with total number of words only.

Background

Within the context of a larger protocol, persons with aphasia (PWAs) were asked to describe the simple procedure of how to make a peanut butter and jelly (PBJ) sandwich. Closely constrained discourse tasks of this type have been shown to reduce individual variability (Jensen, 2012) and linguistic diversity (Fergadiotis, et al 2011). This type of discourse is considered less challenging than personal narrative, story retelling, and even picture description (Weiss, 2012), because it is concerned with specific concrete goals and sequencing (Ulatowska & Bond, 1983). Also, tasks of this type are familiar, because they are quite common in everyday discourse (Bartels-Tobin & Hinckley, 2005).

The participants and tasks for the current study were gleaned from the computerized, shared database for the study of communication in aphasia, called AphasiaBank. This archive is well described in Muller and Ball (2013). It contains a standardized protocol comprising a number of discourse tasks (personal narrative, picture descriptions, and story telling) in addition to the procedural discourse task of describing how to make a peanut butter and jelly sandwich that is the focus of this paper. The PBJ task is relatively commonly used with individuals who have a wide variety of neurological impairments. The present paper will analyze responses to the PBJ task to examine the following questions.

1. Do the total number of utterances, total number of words, time on task, and mean length of utterance:
   a) differ across PWAs and non-aphasic participants; and
   b) correlate with aphasia severity within the PWA group?

2. Does the essential lexicon (top 10 nouns and verbs) produced for this task differ across PWAs and non-aphasic participants?

3. Does the percent of certain parts of speech (nouns, verbs, pronouns, determiners) differ for PWAs and non-aphasic participants?

4. What types of errors do the PWAs make on the essential lexicon?

Method

Participants

The 141 PWAs studied here all had aphasia as the result of stroke, verified by neurological evidence, by clinical report, and by formal testing using the Western Aphasia Battery (WAB; Kertesz, 2007). All responded verbally, without needing a stimulus picture prompt.

Comparison participants were 145 non-aphasic adults who completed the AphasiaBank protocol. All were tested with the Mini-Mental State Exam (Folstein, Folstein, & McHugh, 1975) and the Geriatric Depression Scale (Brink, Yesavage, Lum, Heersema, Adey, & Rose, 1982) to rule out cognitive impairment and depression.

Sessions were recorded on videotape for both groups. Table 1 shows their demographic characteristics.

Task and Analysis

Participants were asked, "Tell me how you would make a peanut butter and jelly sandwich." No visual or written prompts were offered unless the participant could not respond to the verbal prompt. Those extra-prompted responses were not included in this study.

Responses were transcribed in CHAT format (MacWhinney, 2000). CHAT is a transcription format that has been developed over the last 30 years for use in a variety of disciplines (e.g., first language acquisition, second language acquisition, classroom discourse, conversation analysis). The system offers ways to code a wide variety of linguistic behaviors such as repetitions, revisions, sound fragments, fillers, incomplete words, unintelligible speech, missing words, gestures, and a variety of speech production errors. Also, the CHAT transcription format is designed to operate closely with a set of programs called CLAN, which permit the analysis of a wide range of linguistic and discourse structures (MacWhinney, 2000).

Trained research assistants transcribed the videotaped samples. Following guidelines from Berndt et al. (2000), utterances were segmented based on the following hierarchy of indices: syntax, intonation, pause, semantics. Investigators coded errors were coded at both the word and sentence level. For word-level errors, we developed a hierarchical system to capture errors in six categories: phonology, semantics, neologism, dysfluency, morphology (bound), and formal lexical device. Within each category, errors were coded further to capture whether the error was a word or non-word, whether the target was known or unknown, what type of suffix was missing, and more. Errors that involved neologisms were transcribed using IPA. Two SLPs, with aphasia experience and transcription training, checked the accuracy of transcription and error coding in 33% of the samples and the two reached forced choice agreement on all features of the transcription.

For all CLAN analyses, the following forms were excluded from analysis: repeated words, revised words, fillers, word fragments, unintelligible words. For all statistical tests, alpha was set at $p<.05$.

Results

Not unexpectedly, the total number of utterances, total number of words, time on task, and mean length of utterance were all significantly different (two-tailed t-tests) for non-aphasic participants versus PWAs. The PWAs took longer to complete the task than did the comparison group. In addition, the comparison group produced significantly more total utterances, used longer utterances, and had longer MLUs than did the PWA group. Table 2 displays the means and ranges for all variables for both groups.

In contrast to all those group differences, the two groups produced almost identical lexicons. Tables 3 and 4 show the top 10 nouns and verbs, respectively, in descending order of frequency. These words are collapsed by stem (so, for example, "piece" and "pieces" would count as the noun, "piece"). The nouns are the same for both groups, but in a slightly different order. The verbs are the same with the exception of "would" and "go" in the comparison group, and "be" and "eat" in the PWA group. Also, the mean percent of nouns and verbs used was similar across groups, as illustrated in Figure 1. Chi-square tests indicated no significant differences.

Using the WAB Aphasia Quotient as a measure of severity, Pearson-r was calculated within the PWA group and revealed a negligible correlation with time on task, a weak correlation with total number of utterances, and a moderate-strong positive correlation with total number of words ($r=.41$).

Error analyses on key lexical items in the task revealed different types of errors based on the target word. For each main word that had at least 10 error productions, Tables 5-8 show the actual error productions organized by error type. Figure 2 shows the comparative frequencies of phonetic, semantic, and neologistic errors for each word.

Discussion and Conclusion

This short and simple procedural discourse task revealed large differences between PWAs and non-aphasic participants in quantitative measures. However, the qualitative and functional differences between the groups were minor. Though the PWAs produced fewer words, fewer utterances, and shorter utterances in a longer period of time, the main nouns and verbs they used were similar and the proportions of nouns, verbs, pronouns, and determiners used in the discourse samples were similar to those of the comparison group. Increased severity of aphasia was associated with fewer words, but not necessarily less time on task or fewer total utterances. Word errors occurred more frequently on certain words and were much more likely to be phonemic errors or neologisms than semantic errors. These results will be analyzed further and compared with: 1) the results of other investigations of procedural discourse; and 2) the results of other types of discourse tasks. Finally, the clinical utility of this measure will be discussed.

References

Bartels-Tobin, L. R., & Hinckley, J. J. (2005). Cognition and discourse production in right hemisphere disorder. *Journal of Neurolinguistics*, *18*(6), 461-477.

Berndt, R., Wayland, S., Rochon, E., Saffran, E., & Schwartz, M. (2000). *Quantitative production analysis: A training manual for the analysis of aphasic sentence production*. Hove, UK: Psychology Press.

Brink T. , Yesavage, J., Lum, O., Heersema, P., Adey, M., & Rose, T. (1982). Screening tests for geriatric depression. *Clinical Gerontologist 1:* 37-44, 1982.

Fergadiotis, G., Wright, H.H., & Capilouto, G. (2011). Productive vocabulary across discourse types. Aphasiology 25(10), 1261-1278.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12*(3), 189-198. doi:10.1016/0022-3956(75)90026-6

Jensen, C.L. (2012). Age, attention, and OTS in a constrained vs unconstrained task. University of Kentucky. Master's Thesis.

Kertesz, A. (2007). *Western Aphasia Battery Revised*. San Antonio, TX: Psychological Corporation.

MacWhinney, B. (2000). *The CHILDES project: Tools for analyzing talk. Third Edition.* Mahwah, NJ: Lawrence Erlbaum Associates.

Muller, N. & Ball, M. (2013). *Research Methods in Clinical Linguistics and Phonetics: A Practical Guide.* West Sussex, UK: Wiley-Blackwell.

Ulatowska, H. & Bond, S. (1983). Aphasia: Discourse considerations. *Topics in Language Disorders, 3(4),* 21-34.

Weiss, J.A. (2012). Differential performance across discourse types in MCI and dementia. The Ohio State University. Master's Thesis.

Table 1.
Demographic characteristics

	Control n=145	PWA n=141*
Age (mean, range)	66.7 (23-89.5) years	63.6 (34.4-90.7) years
Gender	50% female	39% female
Education (mean, range)	15.2 (10-22) years	15.7 (11-25) years
WAB Aphasia Quotient	NA	74.3 (20.2-99.6)

* Missing age and education data on 8 participants

Table 2.
Means (ranges) for PBJ discourse task measures

	Control n=145	PWA n=141
Total utterances	10.36 (3-42)	6.75 (1-40)
Total words	87.66 (19-363)	38.32 (1-264)
Time on task (in seconds)	30.34 (6-117)	37.71 (3-313)
MLU (in words)	8.49 (4.75-17.4)	5.45 (0.5-14.5)

Table 3.
Top 10 nouns in descending order of frequency

Control	PWA
bread	butter
butter	peanut
peanut	bread
jelly	jelly
slice	sandwich
knife	piece
piece	knife
jar	side
side	slice
sandwich	jar

Table 4.
Top 10 verbs in descending order of frequency

Control	PWA
put	put
will	get
get	be (copula)
take	will
spread	take
be (copula)	have
have	spread
cut	eat*
would*	be (auxiliary)*
go*	cut

* words that do not appear in the top 10 for both groups

Table 5.
PEANUT – 35 errors, 182 correct productions

phon – word	**phon-non-word**	**sem – related**	**sem - unrelated**	**non-word**
penis (3x)*	/pɛnʌt/ /binʌt /(3x) /pinmɪt/ /pɹinʌt/ /binɪt/ (2x)	peanuts	pitter beater pita (2x) peter (2x)	/pinəˠ/ /pitɑʊn/ /pidənt/ /piɾɪʃ/ /pinəˠ/ /pintəˠ/ /pɛnet/ /pəninʌt/ /pɛnə/ /bɛs/ /bɹɪŋət/ /pin/ /tutə/ /pəˠlæt/ /bɛnɪt/ /bito/ /binə/

Table 6.
BREAD – 16 errors, 187 correct productions

phon – word	phon-non-word	sem – related	sem - unrelated	non-word
head	/bɹæd/	sandwich	put	/blæd/
bride	/bɹɛdʒ/	peanut butter		
bed (3)	/bɹɛt/	breads		
breadth	/gɹɛd/			
red				

Table 7.
BUTTER – 15 errors, 238 correct productions

phon – word	phon-non-word	sem – related	sem - unrelated	non-word
batter (2)	/bʌðɚ /(3)		much	
better (2)	/bʌθɚ/			
putter	/bɹʌɾɚ/			
mutter	/bɹʌtɚ/			
	/bʌpɚ/			
	/fʌɾɚ/			

Table 8.
JELLY – 10 errors, 146 correct productions

phon – word	phon-non-word	sem – related	sem - unrelated	non-word
	/tɛlɪ/	sandwich		/mʌneɪ/
	/tʃɛlɪ/			/dʒæɹɪ/
	/dʒɝlɪ/			
	/dʒɛdlɪ/			
	/dʒulɪ/			
	/ʃɛlɪ/			
	/sɛlɪ/			

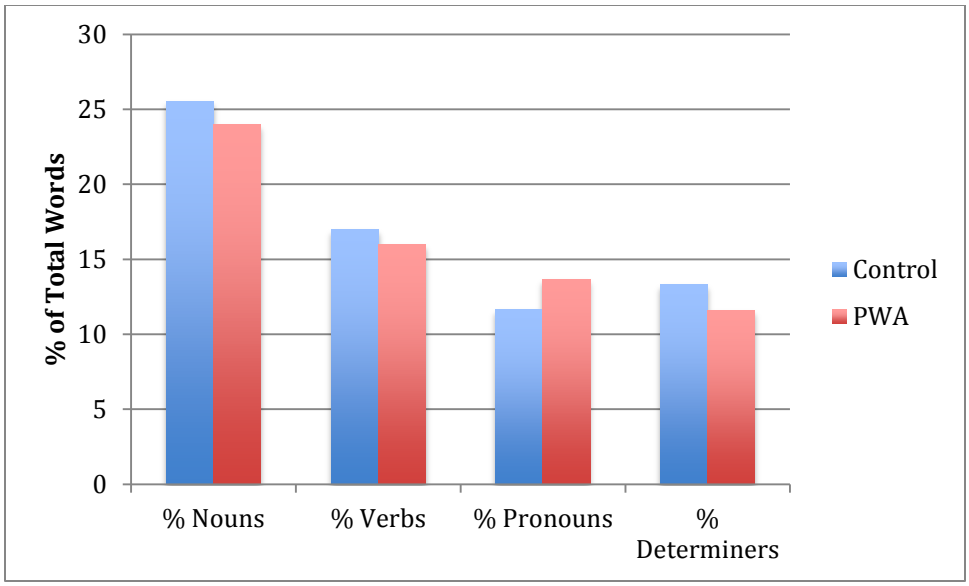

Figure 1. Mean percent of parts of speech for both groups

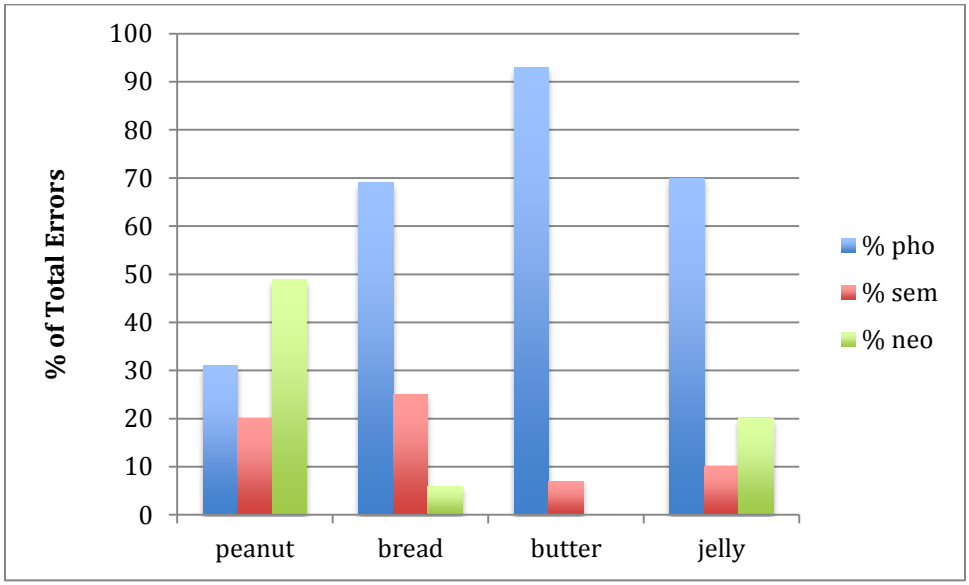

Figure 2. Error types for key words in PWA lexicon