

Main Concept Production in Persons with Aphasia: A Comparison of Subtypes

Introduction

Narrative abilities are negatively impacted in persons with aphasia (PWAs), with even the mildest PWAs producing narratives that, though well-structured, are characterized by reduced lexical diversity, complexity, content, length, coherence, and more (e.g., Andreetta, Cantagallo, & Marini, 2012; Capilouto, Wright, and Wagovich, 2006; Fergadiotis & Wright, 2011; Nicholas & Brookshire, 1995; Ulatowska, North, & Macaluso-Haynes, 1981). Even those categorized as “not aphasic by WAB” (NABW) produce significantly different story retell narratives compared to typical and aphasic peers (Author2, Dillow, & Author1, 2013). Diminished narrative abilities, and associated reduced functional communication, have a marked negative impact on quality of life (QoL) in PWAs, more so than physical limitations that accompany stroke (Hilari, 2011; Northcott & Hilari, 2011). Indeed, narrative ability may be a better predictor of life participation and QoL than traditionally administered outcome measures (Ross & Wertz, 1999), making imperative the advancement of narrative assessment and treatment.

Three primary barriers to narrative assessment impede widespread use - standardization, norm-reference, and time constraints. AphasiaBank developers (<http://talkbank.org/AphasiaBank/>) addressed the first barrier by making available a standard discourse protocol. Regarding the second barrier, norm-referenced Main Concept (MC) lists based on 150+ control transcripts for three different types of discourse were recently developed using AphasiaBank (Author2, Campbell, Williams, Dillow, & Author1, 2013). The MC lists included concepts spoken by 50% of the control population. The authors elected to develop MC lists primarily because 1) MC analysis is a reliable and valid method of assessing narrative adequacy in PWAs (Nicholas & Brookshire, 1995), and 2) generation of standardized, norm-referenced, non-transcription-based MC lists would reduce the amount of time required for narrative assessment (third barrier).

Previous MC research has revealed differences between controls and PWAs, and between fluent and non-fluent PWAs (Kong, 2009, 2011; Nicholas & Brookshire, 1995). Previous MC studies have also combined certain codes (see Discussion), which may lead to inaccurate representation of communicative abilities and/or masking of differences between subtypes. We extracted lengthy narrative samples of a large group of PWAs and analyzed the samples with a multi-level MC coding system using norm-referenced MCs in order to determine 1) if there were significant differences in MC production between different aphasia subtypes, and 2) if so, which subtypes were significantly different from each other.

Methods

Transcripts

Transcripts of 71 PWAs (15 anomic, 17 Broca's, 16 conduction, 11 NABW, 12 Wernicke's) were retrieved from the AphasiaBank database. Three narrative samples were extracted from each transcript to provide a more complete estimate of narrative abilities than would be provided with a single sample. The samples included the Cinderella story (story retell), Breaking Window (picture sequence description), and Making a PB&J Sandwich (procedural discourse).

Scoring

Each story was coded using the preliminary MC lists presented by Author2 et al. (2013), which included 35 MCs for Cinderella, 8 MCs for Breaking Window, and 8 MCs for Making a

PB&J Sandwich. The presence, accuracy, and completeness of each identified MC were analyzed according to established criteria (Nicholas & Brookshire, 1995) and given one of the five following codes: 1) Accurate/Complete (AC) - all essential elements of the concept were produced correctly. 2) Accurate/Incomplete (AI) - some essential elements were produced correctly, but at least one essential element was omitted. 3) Inaccurate/Complete (IC) – all essential elements were produced, but at least one essential element was inaccurate. 4) Inaccurate/Incomplete (II) – the concept was missing at least one essential element with another essential element produced incorrectly. 5) Absent (AB) – no essential elements of the concept were produced. To create a composite score, a numeric value (0-3) was assigned to each code (AC = 3, AI = 2, IC = 2, II = 1 and AB = 0) (adapted from Kong, 2009, who combined IC and II codes). After coding/scoring each story, the overall scores for each code and the composite score was determined by summing across all three stories for each transcript.

Data Analysis

Omnibus median tests for each MC code and composite score were conducted to determine if differences existed between aphasia subtypes. Planned comparisons (median tests, Holm-Bonferroni corrected) were conducted to determine which subtypes were significantly different from each other.

Results

Omnibus median tests for each scoring code and for the overall composite score indicated significant differences between aphasia subtypes for the following: AC, $\chi^2(4, n=71) = 36.26, p < .001$; II, $\chi^2(4, n=71) = 17.7, p = .001$; AB, $\chi^2(4, n=71) = 15.72, p = .003$; and overall composite score, $\chi^2(4, n=71) = 22.78, p < .001$.

Planned comparisons were completed for each code and for the composite score. For AC codes, significant differences were revealed between Broca's and 3 subtypes (anomic [$\chi^2 = 18.99, p < .001$], conduction [$\chi^2 = 11.22, p = .001$], and NABW [$\chi^2 = 28, p < .001$]), between Wernicke's and 2 subtypes (anomic [$\chi^2 = 8.58, p = .003$] and NABW [$\chi^2 = 16.22, p < .001$]), and between conduction and NABW ($\chi^2 = 7.816, p = .005$). Two comparisons were significant for the II code, conduction versus anomic ($\chi^2 = 11.89, p = .001$) and NABW ($\chi^2 = 11.34, p = .001$). For AB codes, there were significant differences between NABW and 3 subtypes (Broca's [$\chi^2 = 13.588, p < .001$], conduction [$\chi^2 = 7.82, p = .005$], and Wernicke's [$\chi^2 = 11.24, p = .001$]). For the MC composite score, there were significant differences between NABW and 3 subtypes (Broca's [$\chi^2 = 18.12, p < .001$], conduction [$\chi^2 = 7.82, p = .005$], and Wernicke's [$\chi^2 = 13.55, p < .001$]), and between Broca's and anomic ($\chi^2 = 7.94, p < .005$).

Discussion

Our study supports previous findings of differences between fluent and non-fluent aphasia types for the AC and AB codes and for the MC composite score (Kong, 2009). We extend this knowledge by revealing similarities and differences between and within the fluent-nonfluent categories. Importantly, no significant differences for MC codes or MC composite were observed between Broca's and Wernicke's aphasia. Further, differences were observed between fluent subtypes. This project is also the first to provide detailed MC data for a subset of stroke patients who exhibit narrative deficits but who are NABW.

Nicholas and Brookshire (1995) suggested that as aphasia severity increases, the number of missing main concepts also increases. However, we did not observe significant differences for absent (AB) codes between aphasia subtypes (though this does not necessarily indicate equivalence). We interpret this as an indication that individuals with aphasia of the varying types

and severities included in this study make similar numbers of attempts to convey MCs and that differences arise when evaluating the accuracy and completeness of those attempts.

IC and II codes have been combined in previous studies, which may not accurately reflect communicative abilities. For example, a complete concept with a semantic paraphasia (IC) is more informative than an incomplete concept with a semantic paraphasia (II). This was the first study to find this distinction important when determining differences between subtypes (i.e., conduction v. anomic and NABW) and we encourage the use of IC and II as separate codes, with different values for the composite score, in future MC research. The composite score is likely to be useful for future clinical and research purposes. Still, retaining information about different main concept codes may improve the specificity of intervention approaches (e.g., focusing on concept accuracy versus completeness, depending on patient profile) and may be useful in charting treatment-induced improvement. In addition, nuanced information about MCs (using codes) may provide a more sensitive indicator of differences between aphasia subtypes and between NABWs and controls, with the latter difference potentially able to change current treatment delivery and termination practices for the NABW population.

References

- Andreetta, S., Cantagallo, A., & Marini, A. (2012). Narrative discourse in anomic aphasia. *Neuropsychologia*, *50*(8), 1787-1793.
- Capilouto, G. J., Wright, H. W., & Wagovich, S. A. (2006). Reliability of main event measurement in the discourse of individuals with aphasia. *Aphasiology* *20*(2/3/4), 205-216.
- Fergadiotis, G. & Wright, H. H. (2011). Lexical diversity for adults with and without aphasia across discourse elicitation tasks. *Aphasiology*, *25*(11), 1414-1430.
- Hilari, K. (2011). The impact of stroke: Are people with aphasia different to those without? *Disability and Rehabilitation*, *33*(3), 211-218.
- Author2, Campbell, S.L., Williams, A.N., Dillow, E. P., & Author1. (2013). Development of clinician-friendly discourse analysis tools: Main concept analysis. Poster presented at the Annual Convention of the American Speech-Language-Hearing Association. Chicago, Illinois.
- Author2, Dillow, E. P., & Author1. (2013). Core lexicon analysis: Efficient assessment of narrative discourse in persons with aphasia. Technical research session presented at Annual Convention of the American Speech-Language-Hearing Association. Chicago, Illinois.
- Kong, A. P. (2009). The use of main concept analysis to measure discourse production in Cantonese-speaking persons with aphasia: A preliminary report. *Journal of Communication Disorders*, *42*(6), 442-464.
- Kong, A. P. (2011). The main concept analysis in Cantonese aphasic oral discourse: external validation and monitoring chronic aphasia. *Journal Of Speech, Language & Hearing Research*, *54*(1), 148-159.
- Nicholas, L. E., & Brookshire, R. H. (1995). Presence, completeness, and accuracy of main concepts in the connected speech of non-brain-damaged adults and adults with aphasia. *Journal of Speech, Language, and Hearing Research*, *38*, 145-156
- Northcott, S. & Hilari, K. (2011). Why do people lose their friends after a stroke? *International Journal of Language and Communication Disorders*, *46*(5), 524-534.
- Ross, K. B., & Wertz, R. T. (1999). Comparison of impairment and disability measures for assessing severity of, and improvement in, aphasia. *Aphasiology*, *13*, 113-124.
- Ulatwoska, H. K., North, A. J., & Macaluso-Haynes, S. (1981). Production of narrative and procedural discourse in aphasia. *Brain and Language*, *13*(2), 345-371.