



The Effects of Gesture Frequency On Discourse Production In Anomic Aphasia: A Preliminary Investigation

Theodore Jenkins¹, Marie Coppola^{2,3}, & Carl Coelho¹

Department of Speech, Language, and Hearing Sciences¹; Psychological Sciences²; Linguistics³
University of Connecticut

Research Supported by NSF IGERT Grant #1144399



INTRODUCTION:

- Hand gestures and body movements are considered a communicative modality (McNeill, 1992)
- Persons With Aphasia (PWA) produce gestures despite inherent language deficits (Goodwin, 2000)
- Anomia is a type of aphasia that is associated with lexical retrieval difficulties
- Gesture can aid in the facilitation of cognition, especially in the lexical retrieval in typical and PWA populations (Kelly et al., 2009; Rose & Douglas, 2001)
- A previous study has shown positive correlations between micro- and macro-linguistic difficulties for Anomic PWAs (Andreetta, Cantagallo, & Marini, 2012)
- Anomic PWAs' success with greater syntactic complexity and narrative organization may be linked to the facilitation of hand gestures for lexical retrieval

CURRENT QUESTIONS:

- Is gesture frequency during story retelling correlated with micro- and macro-linguistic measures of narrative discourse?
- Is gesture production in PWA discourse associated with appropriate lexical retrieval?
- Does gesture production in PWA have bottom-up effects on narrative production?

METHODS:

- Participants:**
 - 41 PWAs (21 male; mean age = 62.8) diagnosed as *anomic* via Western Aphasia Battery (WAB; Kertesz, 1982)
- Narrative Task:**
 - Retell the Cinderella story after viewing a story book without words. Narratives were obtained from *AphasiaBank* (MacWhinney, 2000)



- Discourse Analyses:**
 - Story Length: # of T-Units (Lê et al., 2011)
 - Sentence Complexity: # of subordinated clauses within all matrix clauses (Lê et al., 2011)

SCs	Example
0	<i>Cinderella married the prince.</i>
1	<i>Cinderella married the prince who loved her.</i>
2	<i>Cinderella who was beautiful married the prince who loved her.</i>

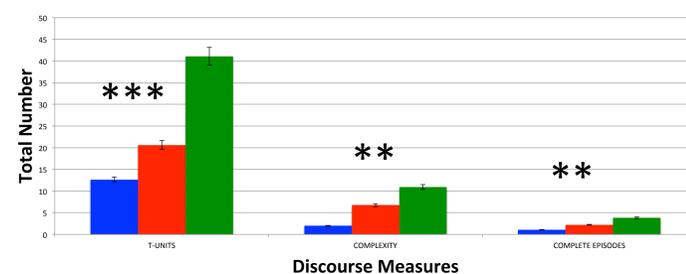
- Narrative Organization: # of Complete Episodes (Lê et al., 2011)

	Episode Component	Definition
1	Initiating Event	A character is motivated to do a goal
	Example	<i>Cinderella wanted to go to the ball.</i>
2	Action	Done in pursuit of that goal
	Example	<i>Cinderella made a dress of rags to attend.</i>
3	Direct Consequence	Marks attainment or non-attainment of the goal
	Example	<i>Her stepmother ripped the dress apart to stop her.</i>

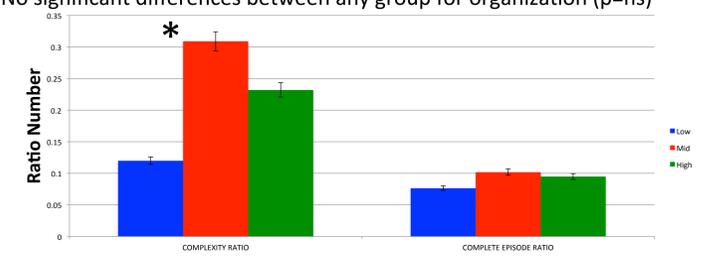
- Lexical Diversity:**
 - Narrative samples were also analyzed for textual cohesiveness and lexical diversity using *Coh-Metrix*, an automated text-analysis program (McNamara et al., 2014)
 - Type Token Ratio (i.e. TTR): Index of unique words produced in a given text (e.g. Cinderella → fairy, slipper, mouse, etc.). A higher index is indicative of a text with more unique words, however is associated with decreased textual cohesion (McNamara et al., 2014).
 - Lexical Diversity (i.e. VOCD): Frequency score of related individual words used in a given text (e.g. Cinderella → slipper, shoe, boot, etc.). A higher number is indicative of text with more related words. This is associated with increased cohesion (McNamara et al., 2014).
- Gesture Analyses:**
 - Classified as co-verbal *and* having a clear stroke of movement (based on McNeill, 1992)
 - PWAs were separated into three different groups based on number of gestures produced (Low, n=14; Mid, n=13; and High, n=14)
- Lexical Retrieval Analyses:**
 - Transcripts were analyzed for problems of lexical access for *content* words
 - Following Brown & McNeill (1966), a specific linguistic target was considered to be a lexical retrieval issue, if the speaker could only produce some part of the word (e.g. single phoneme, syllable, etc.)
 - Follow up analysis, considered whether or not lexical issue was resolved (i.e. appropriate lexical selection) and whether or not, lexical issues was accompanied with a gesture
- Statistical Analyses:**
 - Discourse measures were analyzed using a One Way ANOVA between groups
 - Initial analysis compared total number of discourse measures between groups
 - A follow up analysis controlled for varied story length effects on discourse measures (i.e. simply producing more language may lead to more syntactic complexity)
 - Ratios were calculated for grammatical complexity (e.g. # subordinated clauses/total # of T-Units)

RESULTS:

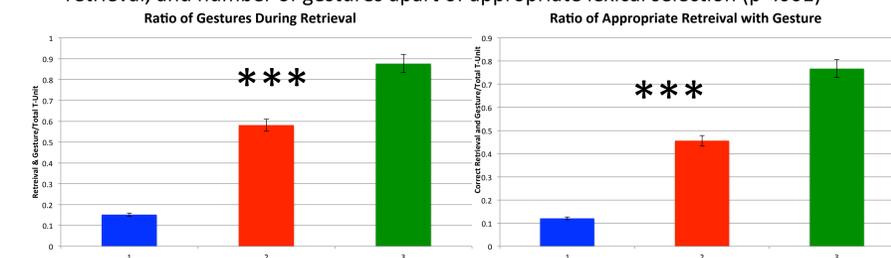
- Gesture Frequency:**
 - Significant Differences Between All Three Groups ($p < .01$)
- Aphasia Severity:**
 - No significant differences in WAB scores between groups ($p = ns$); differences in discourse measures thought not to be attributed to differences in aphasia severity
- Initial Analysis**
 - Significant Differences Between The High and Low Gesture Groups for Narrative Length ($p < .001$), Complexity, ($p < .05$), and Organization ($p < .001$).



- Discourse Measure Ratios (i.e. Measure/Total T-Units):**
 - Mid Group* frequency significantly higher than the *Low Group* for syntactic complexity ($p < .05$), but no differences between *High Group* and others ($p = ns$)
 - No significant differences between any group for organization ($p = ns$)



- Type Token Ratio & Lexical Diversity:**
 - TTR significantly higher for the Low Group compared to the High Gesture group ($p < .001$), suggesting that lower gesturers are more likely to produce a word only once in a narrative.
 - VOCD significantly higher for the *High Group* compared to the *Low Group* ($p < .001$), suggesting that higher gestures are more likely to produce more related words.
- Lexical Retrieval:**
 - Significant differences between groups for incidences of lexical retrieval (Group 1=9.57; Group 2=15.46; Group 3=25.21; $p < .001$)
 - No significant differences in lexical retrieval resolution (Group 1=85.33%; Group 2=79.10%; Group 3=85.84%; $p = ns$)
 - Accounting for narrative length (e.g. # of lexical retrievals/Total T-Units), no differences in lexical retrieval incidence ($p = ns$)
 - Significant differences between groups for number of gestures produced in lexical retrieval, and number of gestures apart of appropriate lexical selection ($p < .001$)



DISCUSSION:

- High gesture frequency seems to be positively associated with increased length, syntactic complexity, and narrative organization
- Taking into account the length of each story, syntactic complexity still remains significantly higher for more frequent gesturers
- Higher gesturing groups seem to be associated with narratives that produce more related words than unique ones (i.e. TTR & VOCD), which has been linked to improved discourse cohesion (McNamara et al., 2014)
- Higher gesture groups had more incidence of appropriate lexical retrieval online
 - Taking into account the sample length, no significant differences for appropriate lexical selection
 - However, gesture is significantly more present in lexical selection in longer samples, as well as appropriate selection
- In this study, higher gesture frequency seems to be associated with increased micro-levels of language production
- Gesture may be linked to better discourse in situations that require more language to be produced
- This may be of special interest when examining PWA discourse more frequently used in everyday interactions

REFERENCES:

- Andreetta, S., Cantagallo, A., & Marini, A. (2012). Narrative discourse in anomic aphasia. *Neuropsychologia*, 50, 1787-1793.
- Brown, R., & McNeill, D. (1966). The "tip of the tongue" phenomenon. *Journal of Verbal Learning and Verbal Behavior*, 5, 325-337.
- Goodwin, C. (2000). Gesture, aphasia, and interaction. In D. McNeill (Ed.) *Language And Gesture: Window Into Thought And Action* (pp. 84-98). Cambridge: Cambridge University Press.
- McNamara, D.S., Graesser, A.C., McCarthy, P.M., & Cai, Z. (2014). *Automated Evaluation Of Text And Discourse With Coh-Metrix*. Cambridge: Cambridge University Press.
- Kelly, S.D., McDewi, T., Esch, M. (2009). Brief training with co-speech gesture lends a hand to word learning in a foreign language. *Language and Cognitive Processes*, 24(2), 313-334.
- Kertesz, A. (1982). *The Western Aphasia Battery*. New York: Grune & Stratton.
- Lê, K., Coelho, C., Mozeiko, J., & Grafman, J. (2011). Measuring goodness of story narratives. *Journal of Speech, Language, and Hearing Research*, 54, 118-126.
- MacWhinney, B. (2000). *The CHILDES Project: Tools for Analyzing Talk*. Third Edition. Mahwah, NJ: Lawrence Erlbaum Associates.
- McNeill, D. (1992). *Hand and mind: What gestures reveal about thought*. Chicago: University of Chicago Press.
- Rose, M., & Douglas, J. (2001). The differential facilitatory effects of gesture and visualization processes on object naming in aphasia. *Aphasiology*, 15(10-11), 977-990.