Gesture Frequency and Discourse Quality in Aphasia

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INTRODUCTION:

- Hand gestures and body movements are considered communicative (McNeill, 1992) and can facilitate learning and general cognition (Kelly et al., 2009; Alibali & Goldin-Meadow, 1993)
- Persons With Aphasia (PWA) produce gestures despite inherent language difficulties
- PWA (non-fluent and fluent) tend to gesture more than controls (Sekine et al., 2013)
- In PWA, gesture *may* tax already limited cognitive resources (Meinzer et al., 2007)

CURRENT QUESTIONS:

- Study 1: Is gesture frequency associated with more complex and better organized narratives in PWA and controls?
- Study 2: Are there certain types of gesture (e.g. Iconic, Beat, etc.; McNeill, 1992) that are more common in PWA & control discourse?

METHODOLOGY:

- 29 Non-fluent PWAs (11 female; mean age 54.6) from *AphasiaBank* (MacWhinney, 2000)
- Diagnosed as Broca's Aphasia via Western Aphasia Battery (WAB)
- 29 age- and gender-matched controls
- Asked to retell the Cinderella story after reviewing a story book without words outlining the story; story was retold without the story book present

Study 1: Full narratives were coded for discourse measures (see below)
Study 2: As a follow up, we analyzed a smaller section of these narratives to identify specific gesture types

- Included gestures produced during sections pertaining to the Ball (i.e. Cinderella arriving at the Ball to leaving the ball at Midnight) because: i) the Ball is a central story event, ii) the aphasia narrative protocol specifically asks about this event when a PWA doesn't produce any language (i.e. *Did Cinderella go to the ball?*)
- 21 of the 29 PWA produced at least some information about the ball and, along with their age- and gender-matched controls, were included in this analysis (PWA N=21, Controls N=21; Total N=42)
- Results were analyzed using a One Way ANOVA between groups for discourse measures and gesture types

CODING:

- Narrative Samples were transcribed and analyzed for (Lê et al., 2011):

1. Story Length (T-Units)
2. Sentence Complexity (# of subordinated clauses within all matrix clauses)

Number of Subordinated Clauses	Example
0	*Cinderella married the prince.*
1	*Cinderella married the prince who lived at the palace.*
2	*Cinderella who was extremely beautiful married the prince who lived at the palace.*

3. Narrative Organization (# of Complete Episodes)

	Episode Component	Definition
1	Initiating Event	A character is motivated to do a goal
	Example: Cinderella wanted to go to the ball.	
2	Action	Done in the pursuit of that goal
	Example: Cinderella made a dress of rags in order to go to the ball.	
3	Direct Consequence	Marks attainment or non-attainment of the goal
	Example: The wicked stepmother ripped the dress apart to stop her from going.	

4. All gestures had to be co-verbal *and* have a clear stroke of movement to be considered (based on McNeill, 1992)
   - To control for varied story length, ratios were calculated for gesture frequency, sentence complexity, and narrative organization (e.g. # gestures/total # of T-Units)

5. Gesture Taxonomy was based on McNeill's (1992) original 4 gesture types:

i) *Iconic*: Physically represents the referent (e.g. body shape)
ii) *Metaphoric*: Represents some abstract concept (e.g. passage of time, justice)
iii) *Deictic*: Refers to some target in space (e.g. pointing gesture)
iv) *Beat*: Movement apex falls on the prosodic stress of an utterance/word

Based on some trends in the data, we've included two additional categories that don't seem to fit neatly within the framework of McNeill's categories:

v) *Lexical Retrieval*: Gestures that accompany a speech dysfluency or in times of literally attempting to recall a word (e.g. Tip of the Tongue Phenomenon; Butterworth and Beattie, 1978)
vi) *Other*: Shape and/or function of the gesture were not clear

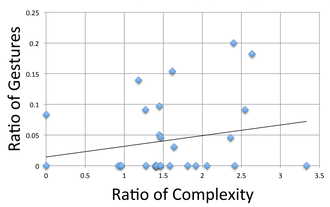
- A research assistant was trained on the discourse and gesture identification methods, and coded all the samples independently. Using a point-by-point inter-rater reliability paradigm, agreement between the RA and the first author exceeded 95% for discourse coding and 90% for gesture identification

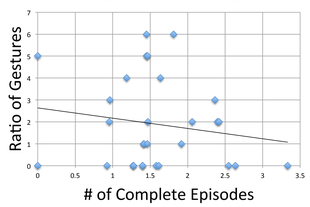
STUDY 1 RESULTS:

- As seen in other studies (Sekine et al., 2013), PWA produced significantly shorter narratives (p=.000) and more gestures (p=.002) than controls

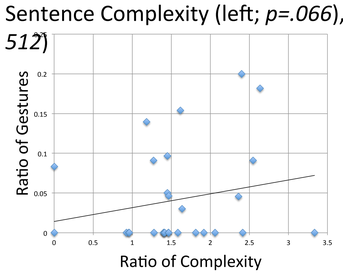
	Group	Average	Min	Max
T Units	PWA	22.24	5	62
	Control	60.31	12	160
Gestures	PWA	32.1	0	90
	Control	14.17	0	66

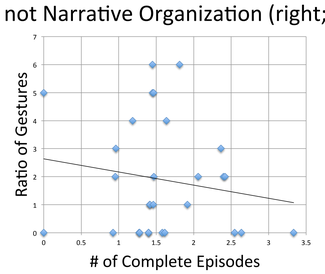
- PWA: There were no significant correlations between Gesture Frequency or Sentence Complexity (left; *p=.295*) or Narrative Organization (right; *p=.976*)



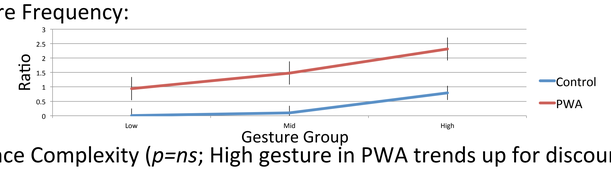


- Control: There was a trending inverse correlation for Gesture Frequency and Sentence Complexity (left; *p=.066*), but not Narrative Organization (right; *p=.512*)

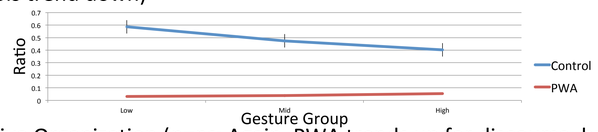




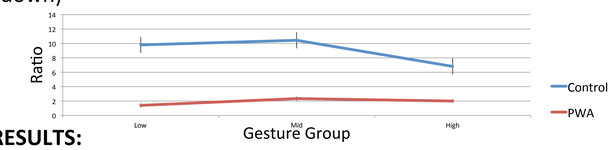
- PWAs and Controls Separated into Gesture Frequency Groups (Low, Mid, High)
  - Gesture Frequency:



  - Sentence Complexity (*p=ns*; High gesture in PWA trends up for discourse, but Controls trend down)

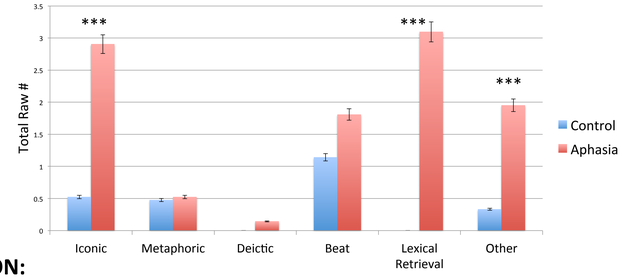


  - Narrative Organization (*p=ns*; Again, PWA trends up for discourse, but Controls trend down)



STUDY 2 RESULTS:

- In agreement with the previous analysis and other studies, the PWA group in this smaller sampling produced significantly shorter narratives (p=.011) and more gestures (p=.000)
- Both PWAs and controls consistently used "representational" gestures from the first 4 categories (i.e. Iconic, Metaphoric, Beat, and Deictic)
- Compared to controls, PWA gestured significantly more: i) Iconic (p=.001), ii) Lexical Retrieval (p=.000), and iii) Other (p=.003); with iv) Deictic (p=.075) trending towards significance



DISCUSSION:

- Gesture frequency does not seem to be associated with better discourse production, for either Sentence Complexity or Narrative Organization
- From the smaller samples, over 40% of the total group PWA gestures were either classified as Lexical Retrieval or Other; Total Control Gestures had less than 15%
- PWAs produced more gestures that do not fit clearly into McNeill's taxonomy
- Gestures in PWA may be playing some cognitive role (e.g. attempting to assist in the getting a word/production out), or the linguistic/representational deficit in aphasia may be more profoundly linked with gesture
- Extensions of this study will examine:
  - i) Does gesture use affect the content of the story (e.g. critical story elements, number of novel propositions)
  - ii) Does the use of a gesture during a dysfluency lead to the appropriate resolution (e.g. finding the word one wants)

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