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Introduction

- Researchers have described how people with aphasia (PWA) typically use gesture (Rose, Raymer, Lanyon & Attard, 2013; Sekine & Rose, 2013).
- Researchers have demonstrated that gesture by PWA can be a useful communication tool for potential interlocutors (Hogrefe, et al., 2013).
- For gestures to be useful in communication, they must be salient enough to draw visual attention.
- We have some idea of what interlocutors look at when typical communicators use gesture (Gulberg & Kita, 2009).
- We do not yet understand what communicative or gestural features most successfully draw attention to gestures by PWA.
- A better understanding of how speech and gestures of people with aphasia interact to draw visual attention to the hands would help guide treatments that use gesture to improve communication for people with aphasia.

Research Questions

- To what extent do healthy interlocutors attend to then hands of people with aphasia?
- What characteristics of the narrative production draw attention to the hands of people with aphasia?

Methods

Stimuli: Videos of seven individuals with non-fluent aphasia responding to the prompt: "Tell me how you would make a peanut butter and jelly sandwich." Videos were downloaded from AphasiaBank (MacWhinney, et al., 2011).

Participants: Eleven native English speakers between 22 and 62 years of age (mean age = 37.3) with typical or corrected hearing and vision participated in this study.

Procedure: Participants provided consent and watched videos of PWA telling how they would make a peanut butter and jelly sandwich. Viewers were told that the speakers have trouble communicating and that we were interested in their impressions of the speakers. Eye tracking was calibrated by the participants watching a moving dot on the monitor, although they were not told that we were collecting eye-tracking data until after the experiment. After each video, participants indicated their agreement with six statements about the speakers' communication on a 7-point scale.



Eye tracking equipment and typical viewer during calibration

Analyses

Segmentation: Each video was divided into "utterances" resulting in 52 separate video segments across the seven videos.

Speech and gesture ratings: Each segment was rated for quality of speech and quality of gesture on a 3-point scale (0 = uninterpretable; 1 = interpretation dependent on context; 2 = interpretable independent of context) by two authors (DK, JPL) with disagreements resolved through discussion.

Areas of Interest (AOIs): Each video was coded for three AOIs: the speaker's left hand, right hand and face. The dependent variable was the percent of time (Net Dwell Time) each participant spent looking at the hands vs. face of the total time they spent looking at all three AOIs for each video segment.

The figures below illustrate video stimuli and segments that were analyzed.

Segment Transcript	"juh jelly"	"in the refrigerator"	"jelly and chu two jars"	"uh sandwich peanut butter and jelly"	"mix it"	"eat it"
Time (sec)	2.8	7.6	19.3	25.8	27	28.5
Gesture Description	relocate on table	point on table	C-hand circling jar lid opening	point at table	mixing gesture	holding utensil arm to mouth
"Bee Swarm" Screenshot						
Proportion of Gaze to Hands (%)	6%	18%	16%	14%	8%	0%

Segment Transcript	"um um"	"oh"	"jam no bread bread"	"jelly jelly"	"um um"	"jam jam yeah"
Time (sec)	9.5	14.6	29	35.7	42.3	49.5
Gesture Description	open palms on table	open cabinet door	bread hands	spreading	c-hand posture	Spread and smash bread together
"Bee Swarm" Screenshot						
Proportion of Gaze to Hands (%)	9%	19%	10%	27%	26%	27%

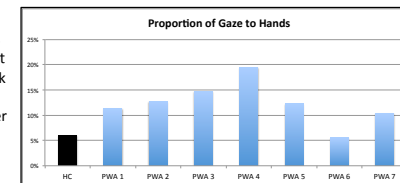
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Results

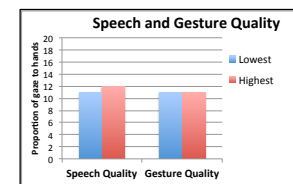
Overall Gaze: Face and Hands

Participants looked more at the hands of PWA (blue bars) than they looked at the hands of one typical speaker (black bar). Variability in looking time to hands of PWA is likely due to a number of factors including quantity and quality of speech and gesture as well as extraneous individual features of the PWA.



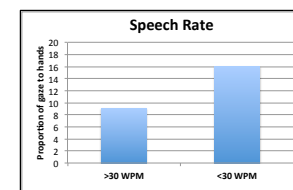
Speech & Gesture Quality

Two reasonable hypotheses are that poorer speech quality and better gesture quality would lead viewers to attend to the speakers' hands. These hypotheses were not supported. T-tests comparing the highest ranked vs. lowest ranked segments for speech and gesture revealed that neither gesture nor speech quality affected proportion of gaze to the hands (Gesture: $t(31) = .085, p = .933$; Speech: $t(26) = .506, p = .617$).



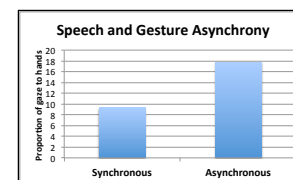
Speech Rate

To explore the hypothesis that slower speech production would lead to greater attention to gesture, we compared proportion of gaze to the hands for segments with a high speech rate (>30 words per minute) to segments with a low speech rate (<30 WPM). This comparison showed a significant difference in the predicted direction with more attention to the hands for those segments associated with a slower speech rate ($t(50) = -3.868, p = .000$).



Speech and Gesture Asynchrony

To explore the possibility that relative timing of speech and gesture is important in guiding visual attention, we compared several instances of the "spreading" gesture which contrasted in synchrony of speech and gesture. Visual attention to the hands was greater for those segments in which speech and gesture were asynchronous compared to those in which speech and gesture were simultaneous (18% vs. 9%).



Discussion

In an attempt to better understand what naturally draws the eye to the hands of PWA, we've documented that typical interlocutors look at the hands of PWA more than they look at the hands of typical communicators and that several factors appear particularly potent in drawing the eye to the hands: **slow speech** and **asynchrony between speech and gesture**. The explanation for these results might be simple: viewers have more time and motivation to look at the hands when a speaker is talking slowly or not talking. This appears true in a relatively uncontrolled narrative production with unguided viewing. These findings suggest two straightforward parameters that might be integrated into treatment to optimize communicative gestures produced by PWA.