Introduction

People with aphasia experience deficits in verbal and written expression as well as reading and auditory comprehension (LaPointe, 2005). Although deficits in any modality may create communication challenges, impairments in auditory comprehension pose a unique set of challenges. For example, when a person cannot comprehend a communication partner's intent, the result may be frustration, increased dependence on caregivers, and development of inappropriate discharge plans (Garrett & Richman, 2007). Furthermore, people who experience auditory comprehension challenges have poorer rehabilitation prognoses for occupational and physical therapy than people without auditory comprehension challenges (Paolucci et al., 2005). As such, developing techniques to support lingering auditory comprehension deficits following traditional rehabilitation efforts is critical (Cherney, Halper, Holland, & Cole, 2008). In this vain, researchers have begun to document the positive effects of using Augmented Input (AI)—a group of strategies (e.g., writing, identifying keywords, gesturing, and employing Likert scales, visuographic supports, and prosodic emphasis)–to supplement spoken speech and support auditory comprehension (Garrett & Lasker, 2005; Garrett & Richman, 2007; Hux, Weissling, & Wallace, 2008).

The AI strategy of employing visuographic supports includes the use of line drawings, iconic symbols, and real photographs (Wood, Lasker, Siegel-Causey, Beukelman, & Ball, 1998); however, researchers have not systematically investigated the effectiveness of each image type on the auditory comprehension of people with aphasia. Therefore, the purpose of this study was to determine the effect of three image types on the auditory comprehension of people with aphasia when they performed a narrative listening task.

Method

Participants

Participants included 21 people with chronic aphasia secondary to single left-hemisphere cerebral vascular accidents. All participants were native speakers of American English and were right handed prior to the onset of aphasia. Participants ranged in age from 37.00 to 85.66 years (M = 66.40; SD = 14.54) and were 6 to 120 months post onset of aphasia (M = 59.91; SD = 37.17). All participants demonstrated functional hearing and visual acuity during informal screenings. To ensure all participants could answer questions using the Written Choice Strategy (Garrett & Beukelman, 1992), each passed a Written Choice screening task with 100% accuracy. Table 1 contains the participants' demographic information including age, time post onset, years of education, *Western Aphasia Battery-Revised (WAB-R)* (Kertesz, 2006) score, and type of aphasia.

Materials

Narratives. The researchers developed four narratives, each with five active voice sentences and two main characters. Each story conveyed a problem and its resolution. The narratives were balanced for number of words (range: 74-75 words) and Flesch-Kincaid Grade Level (range: 5.2-5.5) (Flesch, 1948).

Comprehension questions. For each narrative, the researchers developed 15 multiple-choice comprehension questions to test concrete and abstract comprehension of the information presented. Answer choices included the correct response plus three foils. The researchers formatted the question sets using the Written Choice format (Garrett & Beukelman, 1992).

The researchers calculated the passage dependency index (PDI) using 10 adults without communication impairments with an average age of 39.80 (*SD* = 13.70). The PDI for the narrative passages raged from .32 to .42, suggesting that people were typically unable to respond correctly to questions without prior exposure to the narratives.

Visuographic stimuli. The researchers created three sets of pictures, corresponding to three experimental conditions, for each narrative (the fourth condition contained no visuographic support). Each set of pictures was placed on an 8.5 by 11 inch sheet of paper. The three types of visuographic stimuli are described below.

Isolated photograph condition. Picture sets included five decontextualized, 2.5 inch x 3.5 inch color photographs of single objects or people against a neutral background. The photograph sets were arranged with two pictures in the top row and three pictures in the bottom row.

High-context drawing with embedded photograph condition. The researchers modified two high-context drawings available in Dynavox© Series 5 software for each narrative. The high-context drawings represented settings identified in each narrative (e.g., grocery store aisle). The five related isolated photographs were sized in relation to other items in the scene and overlaid on the contextual drawings in appropriate locations (e.g., grocery store aisle, check-out line). Each of the two finalized high-context drawings measured 4.5 inches by 6 inches.

High-context photograph condition. For each story, the researchers staged two scenes from each narrative (e.g., grocery store aisle, check out-line) that included the five target items from the isolated photograph condition associated (e.g., wallet). Each of the photographed scenes measured 4.5 inches by 6 inches.

Procedures

Participants listened to each of the four narratives, told by the first author, who pointed to each of the five items or characters in the story at appropriate times during story presentation. Following each narrative, participants responded to the 15 comprehension questions. The visuographic stimuli were not available when participants responded to questions.

Research Design and Data Analysis

The researchers employed a repeated measures design to examine the effects of visuographic support type on the auditory comprehension of people with aphasia. To avoid order effects, the researchers systematically varied the presentation order of the four narratives and the assignment of narratives to experimental conditions.

Results

Participants achieved an average response accuracy of 74% (11.10/15) across all stories and conditions. Means scores, ranges and standard deviations of accuracy for each of the conditions are listed in Table 2. Computation of a within groups factorial ANOVA using the LSD procedure (p=.05) revealed no significant difference among types of visual graphic support (F = 1.061, p = 0.373).

Discussion

This study represents an initial examination of three types of visuographic support used as AI for people with aphasia during a narrative listening task. During the experimental task, the type of visuographic support provided did not influence participants' response accuracy.

Three possible explanations exist for these results. The first relates to the lack of personalization of stimuli used in this study. Recent research suggests that people with aphasia prefer and demonstrate more accurate word-picture matching given personalized photographs when compared to non-personalized photographs (McKelvey, Hux, Dietz, & Beukelman, 2010). A second possible explanation is that people with aphasia may respond more positively to visuographic supports during meaningful interactive conversations than during listening tasks that involve non-personal information and events. Third, people with aphasia may require specific instruction on how to use visuographic supports during listening activities. For these reasons, clinicians should individually evaluate the effectiveness of visuographic supports for people with aphasia. Additionally, researchers should systematically investigate the effects of these issues on auditory comprehension.

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Table 1

Participant Demographic and Language Testing Information

Participant	Age (in years)	Gender	Time post-stroke (in months)	Education level (in years)	*WAB-R* classification	*WAB-R* Aphasia Quotient	*WAB-R* yes/no subtest
1	74.66	M	43	18	Conduction	78	57
2	66.66	F	12	11.5	Anomic	80.1	57
3	37.58	M	72	16	Broca’s	55.4	54
4	47.91	M	12	14	Broca’s	57.4	54
5	46.16	M	48	13	Wernicke’s	46.5	54
6	66.16	F	16	13.5	Anomic	88.3	57
7	80.75	M	108	15	Anomic	91.8	57
8	81.75	M	87	14	Anomic	87.3	60
9	56.08	F	120	14	Broca’s	54.8	60
10	49.92	M	24	12	Conduction	66.6	57
11	70	F	18	16	Anomic	93	60
12	62.16	M	84	16	Broca’s	66.5	54
13	75.42	M	102	18	Anomic	78.6	60
14	85.66	F	60	12	Wernicke’s	39.9	30
15	78.5	M	120	12	Anomic	81	57
16	85	F	55	12	Anomic	77	60
17	78	M	108	12	Anomic	74.5	60
18	78.8	M	78	12	Transcortical Motor	70.2	57

19	40.6	M	36	12	Broca’s	31.3	51
20	68.36	M	6	12	Wernicke’s	18	15
21	65.33	M	49	14	Transcortical Motor	46.2	60

Table 2

Response Accuracy in each image condition

Image Condition	Average response accuracy	Response accuracy range	Response accuracy standard deviation
Isolated Photograph	11.76	8-15	2.57
High Context Drawing	10.86	0-15	3.51
High Context Photograph	10.81	3-15	3.09
No Visuographic stimuli	10.95	5-15	3.06