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Augmented input: The effect of visuographic supports on the auditory comprehension of people with chronic aphasia

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Abstract

Background: Augmented input (AI), or the use of visuographic images and linguistic supports, is a strategy for facilitating the auditory comprehension of people with chronic aphasia. To date, researchers have not systematically evaluated the effects of various types of AI strategies on auditory comprehension.

Aims: The purpose of the study was to perform an initial evaluation of the changes in auditory comprehension accuracy experienced by people with aphasia when they received one type of AI. Specifically, the authors examined the effect four types of non-personalized visuographic image conditions on the comprehension of people with aphasia when listening to narratives.

Methods & Procedures: A total of 21 people with chronic aphasia listened to four stories, one in each of four conditions (i.e., no-context photographs, low-context drawings with embedded no-context photographs, high-context photographs, and no visuographic support). Auditory comprehension was measured by assessing participants' accuracy in responding to 15 multiple-choice sentence completion statements related to each story.

Outcomes & Results: Results showed no significant differences in response accuracy across the four visuographic conditions.

Conclusions: The type of visuographic image provided as AI in this study did not influence participants' response accuracy for sentence completion comprehension tasks. However, the authors only examined non-personalized visuographic images as a type of AI support. Future researchers should systematically examine the benefits provided to people with aphasia by other types of visuographic and linguistic AI supports.

Keywords: aphasia, augmented input, auditory comprehension, resource allocation theory

Impairments in auditory comprehension pose unique obstacles to people with aphasia. When people with aphasia cannot comprehend the communicative intents of others they may experience frustration, may have increased dependence on caregivers, and may be subject to medical misdiagnoses and the development of inappropriate discharge plans (Garrett & Richman, 2007). People with auditory comprehension challenges also have poorer rehabilitation prognoses for occupational and physical therapy than people without such challenges (Paolucci et al., 2005). The presence of persistent auditory comprehension deficits creates an environment that impedes communicative interactions; in turn this may adversely affect a person's personal relationships and access to appropriate medical care.

People with aphasia can benefit from the development and implementation of supported comprehension techniques to address deficits that linger despite traditional restorative efforts (Cherney, Halper, Holland, & Cole, 2008). In this vein researchers have documented the positive effects of various types of augmented input (AI) on the auditory comprehension of people with aphasia. Examples of AI strategies include writing keywords, gesturing, and employing Likert scales, visuographic images, and prosodic emphasis to supplement spoken speech and thus facilitate auditory comprehension (Garrett & Lasker, 2005; Garrett & Richman, 2007; Hux, Weissling, &Wallace, 2008). AI strategies support auditory comprehension by increasing the salience of information presented by communication partners (Wood, Lasker, Siegel-Causey, Beukelman, & Ball, 1998).

AI strategies are routinely used both by people with and without communication impairments. For example, when ordering in a noisy restaurant a person might point to key words on a menu; or, to provide directions to a tourist, a person might draw a map designating important roads or landmarks. Because people naturally use AI strategies during day-to-day interactions, applying similar strategies to augment the comprehension of people with aphasia seems logical.

Augmenting Auditory Comprehension for People with Aphasia

Previous researchers have studied whether the presence of linguistic supports improves the auditory comprehension of people with aphasia (e.g., Boyle & Canter, 1986; Hough, Pierce, & Cannito, 1989; Pierce & Destefano, 1987; Pierce & Wagner, 1985; Wright & Newhoff, 2004). In these studies linguistic supports consist of auditorily or visually presented information relating to the target information. For example, when provided with the linguistic support of *vacation*, a person with aphasia might better understand the meaning of the target sentence *The beach was beautiful*.

Researchers have also evaluated the relative effectiveness of linguistic versus visuographic supports to improve the auditory comprehension of people with aphasia. For example, Waller and Darley (1978) compared the differential effect of providing people with aphasia visuographic versus linguistic supports presented prior to listening to target narratives. Specifically, the four pre-stimulation conditions involved: (a) viewing a photograph, (b) listening to a verbal description of the people, objects, and location of the story, (c) simultaneously viewing a photograph and listening to a verbal description, and (d) having no pre-stimulation support materials. Results revealed that people with aphasia demonstrated poorer auditory comprehension performance given the photograph alone or the no pre-stimulation conditions than when given the verbal description or verbal description plus photograph conditions. Participants performed best in the simultaneous verbal and visuographic support condition. In a similar study, Pierce and Beekman (1985) presented people with aphasia with drawings or single sentences that "predicted the target information" (p. 250) prior to hearing three sentence types: simple non-reversible sentences, reversible passive sentences, and reversible active sentences. Provision of visuographic or linguistic pre-stimulation facilitated significantly improved comprehension for at least some of the study participants with aphasia.

The documented success associated with the implementation of AI during listening tasks may be a result of two factors: (a) decreased cognitive load and (b) increased access to prior knowledge. Proponents of the resource allocation theory posit that damage to non-linguistic factors cause either diminished cognitive resources or impaired allocation of cognitive resources in people with aphasia, which adversely affects performance on language tasks (McNeil, 1983; McNeil, Odell, & Tseng, 1991; Murray, 1999). The use of AI may provide information redundancy, which reduces the cognitive load required to complete the task and therefore improves comprehension. More specifically, the redundancy provided by AI supports may increase the ability of people with aphasia to allocate resources to unfamiliar listening tasks by activating prior knowledge. During listening tasks non-brain-injured people rely on prior knowledge to extract meaning from what they hear (Haviland & Clark, 1974). Because of their inherent linguistic impairments, people with aphasia experience challenges extracting information to map onto their prior knowledge during listening tasks. AI materials appear to provide people with aphasia the context necessary for them to extract key information successfully during listening tasks (Waller & Darley, 1978).

In summary, extant literature suggests that linguistic and visuographic supports facilitate improved auditory comprehension in people with aphasia (e.g., Pierce, 1991; Waller & Darley, 1978). Since these early studies researchers have focused more attention on variables related to linguistic-based AI supports. Therefore we lack a clear understanding of the variables related to visuographic-based AI. Some variables that require further examination include comparing the differential effect of (a) the various forms of visuographic-based AI (drawings vs photographs), (b) personalized versus generic AI materials, (c) the provision of multiple versus single AI strategies, and (d) various AI instructional methods targeting communication partners or people with aphasia. As a first attempt to investigate visuographic-based AI in a systematic manner, the researchers decided to examine the effect of presenting various forms of non-personalized visuographic images to support the auditory comprehension of people with aphasia. The next section outlines a framework for differentiating a variety of visuographic images that can serve as AI.

Visuographic Images as a Form of AI

Visuographic images can be personalized or non-personalized. Personalized images are ones that include the person with aphasia or people or objects known to the person with aphasia. Non-personalized or generic images are ones for which the person with aphasia has no familiarity with the people, objects, or places depicted. Non-personalized images were used in the current study. These visuographic images can vary along two dimensions: (a) level of contextualization and (b) image type.

Level of contextualization

Two elements affect the level of contextualization displayed in visuographic images. First, the presence or absence of a natural environment determines whether an image is contextualized or not (Dietz, McKelvey, & Beukelman, 2006). High- and low-context images include a natural environment (e.g., a room decorated for a birthday party with balloons, streamers, and a cake). No-context images depict isolated people or objects against a neutral background (e.g., a birthday cake against a plain background). Within contextualized images a further distinction exists between high-context and low-context images. This distinction is based on the presence or absence of interaction among depicted people, animals, objects, and the environment. Images containing such interactions (e.g., a child blowing out candles on a cake) are high-context; images without such interactions are low-context.

Image types

Two types of visuographic images available for AI are drawings and photographs. Drawings are created with writing or painting utensils or graphic design software; they can be black-and-white or color images with shading being optional. Photographs contrast with drawings in that they are created with a camera and recreate what the human eye sees (Merriam Webster Online, 2011).

Combining contextualization and image types

Both drawings and photographs can vary according to their level of contextualization. As such, drawing and photograph subtypes include no-context, low-context, and high-context. No-context drawings or icons are depictions of single objects, people, or animals with a neutral background and no context; no-context photographs—such as portraits—are similar to no-context drawings in that they portray single objects, animals, or people without interaction and against a neutral background. Low-context drawings are depictions of one or more people, animals, or objects in an appropriate environmental setting but without any interaction present; similarly, low-context photographs depict one or more people, animals, or objects in a natural environment but without any interaction (Dietz et al., 2006; Dietz, Hux, McKelvey, & Beukelman, 2009; Wallace, Hux, & Beukelman, 2010). Low-context drawings and photographs contrast with high-context drawings and photographs in that the latter display one or more people, animals, or objects interacting with one another or the depicted environment (Dietz et al., 2006, 2009).

Combining various types of images provides a means of creating unique visuographic materials. Software applications make it possible to embed drawings or photographs within other drawings or photographs. For example, embedding no-context photographs within high-context drawings is one of several options available to clinicians wishing to modify AI support materials for a particular person with aphasia.

Different levels of contextualization and types of images may help people with aphasia to varying degrees. For example, some people might benefit more from photographs than drawings; others might benefit from high-context drawings or photographs but not from no-context or low-context images. Researchers have yet to determine the types and levels of image contextualization that best support people with aphasia during various listening tasks. Given the promise of using visuographic supports to facilitate auditory comprehension, continued research is critical to advancing clinical interventions for people with aphasia. Therefore the purpose of this study was to determine the effect of four non-personalized visuographic image conditions on the auditory comprehension of people with chronic aphasia during a narrative auditory comprehension task. Specifically, people with chronic aphasia selected single responses from multiple options to complete cloze-type statements reflecting their comprehension of narratives presented simultaneously with (a) no-context photographs, (b) low-context drawings with embedded no-context photographs, (c) high-context photographs, and (d) no visuographic support.

Method

Participants

Participants included 21 people with chronic aphasia secondary to left-hemisphere cerebral vascular accidents. Prior to the onset of aphasia all participants were native speakers of American English, were right-handed, and had no history of developmental language or cognitive disabilities. Participants ranged in age from 37 to 85 years (*M*=66.40; *SD*=14.54), were 6 to 120 months post-onset of aphasia (*M*=59.91; *SD*=37.17), and reported between 11.5 and 18.0 years of formal education (*M*=13.55; *SD*=3.38). A chart review indicated that all participants had functional hearing. Additionally, all participants successfully interacted with the researchers when they spoke at normal loudness levels. The researchers assessed visual perceptual skills using a personalized cancellation task that required participants to scan 25 printed names and cross out their name each of the five times it appeared. The participants also passed a screening procedure to ensure they could accurately answer questions using the Written Choice Strategy (Garrett & Beukelman, 1995)—the format in which reading comprehension questions appeared during the experimental tasks. Specifically, each participant answered cloze-type statements about their personal history using written one-word options that include three foils and one correct answer. Aphasia Quotient (AQ) scores from administration of the *Western Aphasia Battery-Revised (WAB-R)* (Kertesz, 2006) served to document the severity and type of each participant's aphasia (see Table 1).

Materials

Narratives. The researchers developed four generic narratives, each containing five active voice sentences and two main characters. Each story conveyed a problem and a problem resolution. The narratives were balanced for number of words (range: 74–75) and Flesch-Kincaid Grade Level (range: 5.2–5.5) (Flesch, 1948). At least 85% of the words included in each narrative appeared among the 2000 words listed on the Brown University corpus of the most frequently appearing words in written English (Frances & Kucera, 1982).

Table 1. Participant demographic data and aphasia type and severity

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

Comprehension items. Stimuli also included sets of 15 cloze-type statements and multiple response options associated with each narrative to test participants' concrete and abstract comprehension of information presented. Comprehension items targeted information about a narrative's setting, the problem encountered, interpretation about a character's emotional state, and a probable future event. Each statement appeared as an incomplete sentence with four single-word choices available as possible sentence completions. To maximize readability, each statement and the associated response options appeared in 18-point font on a single piece of paper.

The researchers calculated a passage dependency index (Tuinman, 1974) for each narrative and the associated comprehension items using 10 adults without communication impairments. The passage dependency index for the narrative passages ranged from .32 to .42, suggesting that people typically could not select sentence completions to respond correctly to comprehension items without prior exposure to the narratives.

Visuographic stimuli. The researchers created three sets of non-personalized visuographic stimuli to correspond to three experimental conditions—i.e., no-context photographs (NCP), low-context drawings with embedded no-context photographs (LCDNCP), and high-context photographs (HCP); a fourth experimental condition had no visuographic support (NVS) provided. All photographs and drawings were non-personalized in nature in that they did not depict specific objects, settings, or people familiar to the participants in the study. Each image set appeared on an 8.5×11 inch sheet of laminated paper.

Figure 1. Example of no-context photograph stimuli.

No-context photographs. Image sets included five, 2.5×3.5-inch NCPs for each narrative. The image sets were arranged with two photographs in the top row and three photographs in the bottom row. The five photographs depicted characters or objects central to the theme of each story. The five NCPs for one of the stories appear in Figure 1.

Low-context drawings with embedded no-context photographs. The researchers modified two low-context drawings available in Dynavox© Series 5 software for each narrative. The low-context drawings represented settings identified in a given narrative (e.g., grocery store aisle). The five related NCPs were sized in relation to other items in the scene and overlaid on the contextual drawings in appropriate locations (e.g., a wallet on the floor of the grocery store aisle). Each LCDNCP measured 4.5 inches by 6 inches. An example of a LCDNCP for one of the stories appears in Figure 2.

High-context photograph condition. The researchers staged two scenes from each narrative using actors, appropriate settings, (e.g., grocery store aisle, checkout line) and target objects included in the corresponding NCP condition. In each pair of scenes the researchers arranged the environment so that the five target items associated with the scene were clearly visible and appeared in expected locations (e.g., a wallet on the floor of a grocery store aisle). Each HCP measured 4.5 inches by 6 inches. An example appears in Figure 3.

Equipment. The researchers used a digital Sony DCR-SR47 video recorder to capture all experimental sessions.

Procedures

Participants completed the standardized testing and experimental tasks during two sessions. During the first session participants performed the auditory, visual, and Written Choice Strategy screening tests, followed by the Aphasia Quotient portion of the *WAB-R* (Kertesz, 2006). During the second session they performed the experimental tasks.

During the experimental session the participants listened to each of the four narratives told by the examiner. The examiner pointed to each of the five target items or

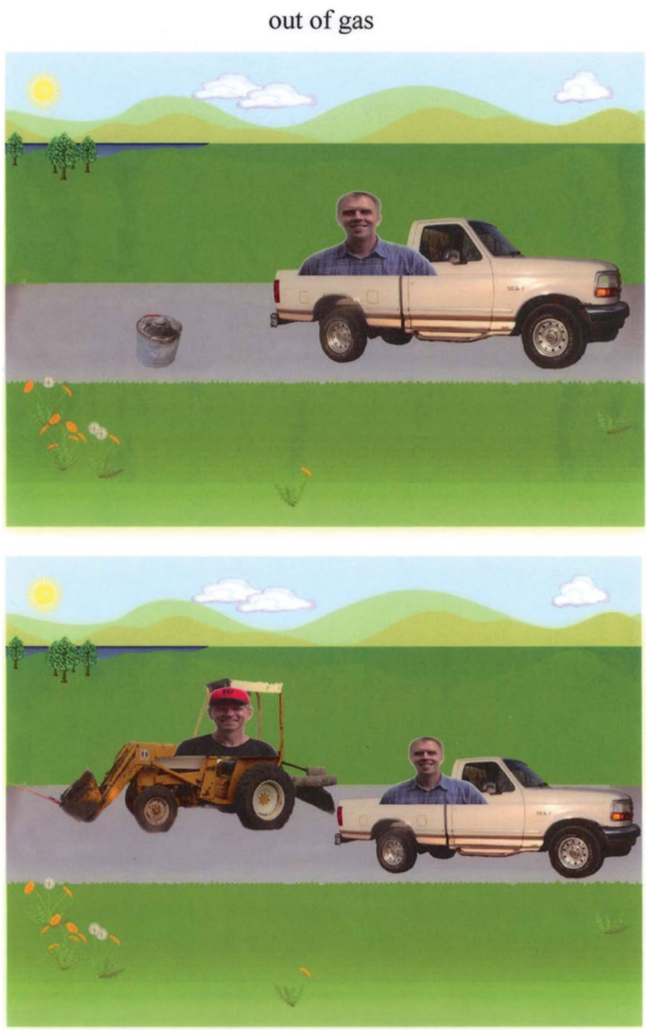

Figure 2. Example of low-context drawing with embedded no-context photograph stimuli.

characters within the visuographic stimuli at appropriate times during story presentation. The appropriate visuographic stimuli were located on the table in front of the participant throughout presentation of each narrative. Following each narrative the examiner removed the visuographic stimuli and presented the 15 comprehension items using the Written Choice Strategy (Garrett & Beukelman, 1995). After placing a typed comprehension item in front of a participant, the examiner read aloud each item and all response options while simultaneously pointing to each potential response. A participant indicated his or her response choice either by verbalizing or pointing to the desired answer. The examiner confirmed the participant's response by circling it on the response page. If requested by the participant, the examiner re-read a comprehension item and the associated response options one time.

The assignment of narratives to experimental conditions and the order of condition presentation were systematically varied across participants. This reduced the possibility

Figure 3. Example of high-context photograph stimuli.

of order effects or any inherent differences among the narratives from influencing the results.

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. Specifically, the researchers analyzed participants' response accuracy across the four image conditions (i.e., NCP, LCDNCP, HCP, and NVS).

Procedural integrity. A trained research assistant viewed a random sampling of 20% of the recordings to evaluate procedural integrity regarding the performance of three researcher behaviors occurring during the story presentations and comprehension questioning. The three behaviors included in the procedural integrity analysis involved:(a) the researcher pointing to the key elements within the visuographic stimuli during story presentation, (b) the researcher removing the visuographic stimuli before presenting the comprehension items, and (c) the researcher following the outlined Written Choice Strategy procedures for presentation of the comprehension items. The assistant determined procedural integrity for each behavior using the following formula:

[*Number of times researcher completed each task*]

Total number of opportunities to complete each task × 100.

Procedural integrity was 100% (15/15) for the researcher pointing to key elements; 100% (3/3) for the researcher removing the visuographic stimuli at the appropriate time; and 100% (45/45) for the researcher following the outlined Written Choice Strategy procedures.

Another means of ensuring procedural integrity involved having a single examiner (i.e., the first author) present the stories and questions to participants. This lessoned the likelihood that factors such as rate and intonation influenced story comprehension.

Results

Participants with aphasia achieved an average response accuracy of 74.00% across all stories and conditions. In the NCP condition participants performed with a mean accuracy of 78.40%; in the LCDNCP condition, they performed with 72.40% accuracy; in the HCP condition they performed with 72.07% accuracy; and in the NVS condition they performed with 73.00% accuracy. Means response accuracy scores, ranges, and standard deviations for each image condition appear in Table 2.

Computation of a within groups factorial ANOVA using the LSD procedure (p=.05) allowed the researchers to examine the effects of image condition on participants' accuracy of selecting responses to complete comprehension statements. Results revealed no significant difference among conditions (F =1.061, p=.373).

To ensure meaningful individual differences were not lost in the group analysis, the researchers performed visual inspection of each participant's performance. As expected the participants with moderate to severe aphasia achieved lower accuracy scores as compared to the participants with mild aphasia; however, the individual analysis did not

Table 2. Response accuracy from comprehension items

Image condition	Average response accuracy out of 15 items	Response accuracy range	Response accuracy standard deviation
No-context photograph	11.76	8 – 15	2.57
Low-context drawing with embedded no-context photograph	10.86	0 – 15	3.51
High-context photograph	10.81	3 – 15	3.09
No visuographic support	10.95	5 – 15	3.06

Table 3. Participants' performance across four image conditions

Participant	WAB-R AQ	No-context photograph	Low-context drawing with embedded no-context photograph	High-context photograph	No visuographic support
1	78	9	14	14	12
2	80.1	15	14	14	12
3	55.4	10	10	11	14
4	57.4	10	9	13	13
5	46.5	9	9	5	7
6	88.3	14	12	15	15
7	91.8	13	9	8	7
8	87.3	14	15	14	14
9	54.8	8	12	12	11
10	66.6	14	9	9	11
11	93	14	12	14	15
12	66.5	10	14	12	9
13	78.6	14	6	11	12
14	39.9	8	0	3	5
15	81	13	14	12	10
16	77	15	15	11	15
17	74.5	15	12	11	12
18	70.2	10	11	9	9
19	31.3	11	13	11	11
20	18	8	9	7	5
21	46.2	13	9	11	11

reveal performance patterns related to the independent variables. That is, some participants with moderate to severe aphasia did not benefit from AI, and not all participants with mild aphasia demonstrated ceiling effects. Individual data are available in Table 3.

Discussion

This study represents an initial examination of three visuographic image types used as AI for people with aphasia during a narrative listening task. During the experimental task the type of visuographic image provided did not affect participants' response accuracy for sentence completion comprehension tasks. However, because the researchers only used non-personalized visuographic images as stimuli, the lack of significant findings requires careful interpretation. Specifically these results represent a preliminary step in the systematic investigation of variables related to the successful implementation of visuographic AI for people with aphasia. As discussed below, other variables—such as personalization of AI supports, implementation of multiple AI strategies, and AI instructional methods—may influence the amount of benefit visuographic AI provides to people with aphasia.

Personalization

The first variable that requires further examination is personalization of visuographic images and narrative stimuli used during auditory comprehension tasks. In the current study the researchers used generic stimuli (i.e., images and narratives), because the focus of the research was on examining the differential effects visuographic image differing in type and contextualization rather than personalization. The use of no personalized images and narratives may have negated the potential positive effect provided through presentation of visuographic AI supports. Two types of personalization can be incorporated as supports for auditory comprehension tasks. First, the visuographic images can be personalized; that is, visuographic images could include photographs or drawings depicting a participant, his or her family members, or specific locations familiar to the participant instead of photographs depicting unknown people or locations. Second, the narrative content itself can be personalized; that is, story characters, settings, and events that are familiar to the participant could be substituted for generic events.

Support for the notion that inclusion of personalized visuographic images and narratives may have yielded different results comes from two sources. First, recent research suggesting that people with aphasia prefer personalized photographs over non-personalized photographs and demonstrate more accurate word-picture matching given this type of support material (McKelvey, Hux, Dietz, & Beukelman, 2010) supports the notion that personalizing AI materials is important. Second, additional support for using personalized AI supports comes from the Given-New Theory (Haviland & Clark, 1974). According to the Given-New Theory, people attach new information to previously stored information to facilitate comprehension. People with aphasia demonstrate challenges with this step in understanding linguistic information; thus, they require assistance in mapping new information onto existing information. Because personalized, high-context images may create strong connections to episodic memory (Mishra & Marjolejo-Ramos, 2010), use of these image types may facilitate retrieval of previously stored information and, in turn, improve understanding of new information.

The use of non-personalized narratives and AI supports may have also adversely affected the participants' selection of correct answers to the comprehension items. Although all participants demonstrated the ability to use the Written Choice Strategy (Garrett & Beukelman, 1995) to answer comprehension questions during the screening procedures, those questions were personalized. The participants may have had difficulty utilizing the Written Choice Strategy given non-personalized response items (Smith, 2005). As such, the participants' comprehension of the narratives may not be accurately reflected in the obtained data.

Multiple AI strategies

Another variable warranting further investigation is the simultaneous use of multiple AI strategies presented during listening tasks. During interactions with people with aphasia, communication partners frequently employ multiple modalities to support comprehension (Hux et al., 2008; Kagan, Black, Duchan, & Simmons-Mackie, 2001). For example, communication partners may present a visuographic image and a written keyword to support their verbal message (Garrett & Lasker, 2005). Because AI provides redundant information that serves to reduce the cognitive load while performing listening tasks (Wright & Newhoff, 2004), the increased redundancy afforded by presentation of a combination of AI strategies (e.g., text and visuographic images) may further benefit people with aphasia. The current study did not provide specific evidence for use of any one visuographic image type as AI; however, visuographic images combined with text (e.g., keywords) may provide the support necessary to improve the auditory comprehension of people with aphasia. Further research examining this possibility is needed.

Instructional methods

The third variable in need of further investigation is the use of instructional methods aimed at helping people with aphasia and their communication partners successfully implement AI strategies. In the current study participants only received limited instruction regarding the use of AI—that is, the examiner simultaneously pointed to key elements of each photograph as she read the associated narrative. Given the limited nature of this instruction, participants may not have sufficiently understood the possible benefit associated with carefully examining the AI supports. Existing literature both regarding aphasia and augmentative and alternative communication (AAC) suggests that detailed instruction is a critical element for successful implementation of multi-modality communication techniques (Garret, Beukelman, & Low-Morrow, 1989; Garrett & Huth, 2002; Garrett & Lasker, 2005; Purdy, 1992, 2002, Purdy & Dietz, 2010; Purdy, Duffy, & Coelho, 1994). Thus people with aphasia may benefit from instruction on how and when to use AI supports during comprehension tasks.

Researchers have also demonstrated the importance of partner instruction to improve the communication skills of people with aphasia (Kagan et al., 2001; Garrett & Lasker, 2005, Purdy & Hindenlang, 2005). According to existing literature, AI instruction should focus on teaching communication partners to provide adequate pre-stimulation to people with aphasia when instructing them in the use the AI supports such as visuographic images. Pre-stimulation involves the presentation of AI or additional information prior to the presentation of a passage and is meant to facilitate comprehension. Pre-stimulation is linked to the success of linguistic-based AI studies (e.g., Hough et al., 1989; Pierce, 1991) and might have been a key factor relating to the success reported by Waller and Darley (1978) regarding the use of visuographic AI supports during a paragraph listening task. As stated previously, auditory comprehension improvements by people with aphasia given AI strategies may reflect aspects of the Given-New Strategy proposed by Haviland and Clark (1974). The simultaneous presentation of the AI supports and a narrative passage in the current study may have exceeded the already limited processing abilities of the participants with aphasia (McNeil, 1983, McNeil et al., 1991; Murray, 1999) and, therefore, prevented them from successfully applying the Given-New Strategy.

Although additional research is needed to determine the appropriate method of instruction for use of AI strategies, previous research suggests that instruction: (a) is beneficial for using multimodality communication strategies, (b) should include partner training, and (c) should include pre-stimulation—that is, presentation of AI supports prior to presentation of the target information.

Summary

This study represents a preliminary attempt to examine one variable related to providing AI support to facilitate auditory comprehension of narrative-length information by people with aphasia. At the present time clinicians must individually evaluate the effectiveness of visuographic images for each person with aphasia. In addition to evaluating the effectiveness of each type of visuographic image, clinicians should also consider the following variables related to AI: (a) personalization of AI supports, (b) implementation of multiple AI strategies, and (c) AI instructional methods. Systematic examination of these issues will provide a framework to guide clinicians and researchers in their understanding and implementation of AI to improve the auditory comprehension of people with aphasia.

Contributions — All four authors contributed to the design of the study. The first two authors took equal responsibility for organizing the findings of this project into this manuscript. Sarah Wallace took the lead for execution and data analysis.

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