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Quantitative Differences in Aphasia Interactions with Visual Scenes AAC Displays

Jennifer M. Seale, Kathryn L. Garrett , Laura Figley
Duquesne University

Abstract

This first study within a two-part, single-subject investigation analyzes the effects of speech generating device (SGD) displays (visual scene, traditional grid, and no display) on conversational interactions between three people with severe aphasia and their communication partners. Personally relevant stories were programmed onto an SGD and symbolized with photographic scenes or individual line drawing symbols. Quantitative data (initiations, successful exchanges, breakdowns, latency of symbol activation, accuracy of symbol activation, topic length, accuracy of symbol recall) were derived from 10-minute, videotaped conversations about the stories and from a delayed recall task administered within 7 days. Clinical implications will be discussed.

Introduction

Augmentative and alternative communication (AAC) interventions for persons with severe aphasia have been shown to improve conversational communication (Bellaire, Georges, & Thompson, 1991; Purdy, Duffy, & Coelho, 1994; Garrett & Beukelman, 1995). An important element of an AAC intervention is the way in which conversational messages are symbolically represented. Speech generating devices (SGDs) are high tech AAC aids that can produce digitized or synthesized voice output, and that represent messages with text, pictures, or photographic symbols. An emerging means of representing complex ideas or stories is Visual Scenes technology (Beukelman, Hux, Weissling, Dietz & McKelvey, 2005). However, no research has systematically measured the efficiency, accuracy, and independence with which persons with severe aphasia access messages across different types of SGD screen displays in conversation.

Methods

Participants. One person with severe aphasia (PWA) and a familiar peer communication partner (PCP) constituted a single dyad, or unit of experimental measurement; 3 experimental dyads participated in this study. Three persons with moderate-to-severe nonfluent aphasia met study criteria: ages 30-85; at least 1 year post-onset of a single, focal left hemisphere CVA; had

an aphasia quotient of ≤ 25 on the Western Aphasia Battery (Kertesz, 1982); spoke English as a primary language; $\geq 12^{\text{th}}$ grade education; showed no dramatic fluctuations in alertness due to medical conditions; had functional hearing and vision, and no evidence of dementia or chronic substance abuse. Communication partners had interacted with someone who had aphasia on a consistent basis for at least one year, were within 15 years of the person with aphasia's age, and had normal intellectual, literacy, and sensory skills.

Design. A single-subject comparative condition design has been implemented to measure within-subject and across-subject differences in dependent variables when messages are accessed with an SGD in *two tasks* (specific small talk and delayed message recall), and across *four conditions* (no display, visual scene display, traditional grid display and preferred display/no display). The first three conditions are replicated twice per dyad and are counterbalanced within and across all dyads to control for possible order effects.

Independent Variables. Each of the 4 study conditions represents a display option on a Dynavox Series 5 SGD:

Condition A (NO SGD DISPLAY): The PWA converses with the PCP using natural modalities (Task 1-discussed below), but the SGD used to display messages in other conditions is turned off (*No Display*). To maintain similarity between conditions, the SGD is placed on the table in view of the participants.

Condition B (SGD--Visual Scene Display): The PWA converses with the PCP (Task 1 – discussed below) and completes the delayed message recall task (Task 2, discussed below) using natural modalities as well as an SGD programmed with 6 individualized photos, with 1-2 word labels, and speech-output messages representing a personal story.

Condition C (SGD--Traditional Grid Display): Tasks 1 and 2 are completed using natural modalities and an SGD programmed with up to 12 individual line drawing symbols and written labels representing elements of a personal story, with captions, and speech-output messages representing a personal story.

Condition D (PREFERRED DISPLAY): Each PWA chooses his/her preferred SGD display or can reject the SGD for conversing (Task 1).

Conditions A, B, and C are replicated for each dyad for a total of 7 experimental sessions per dyad (Sample sequence = ABCBCAD).

Experimental Tasks. Two experimental tasks are used to elicit quantitative data. First, the PWA and the PCP participate in a *10-minute structured conversation* in which the PWA is encouraged to tell a personal story and participants are instructed to ask questions and/or make comments. Stories are selected via interview prior to the study; personal photos and/or line drawing symbols are then chosen to represent the story elements and are programmed onto the SGD. The second task, a *delayed message recall* task, occurs 3-to-7 days after the previous storytelling session. In this task, the PWA retells the story by accessing the same symbol display. In addition, the PWA accesses individual symbols on the display in response to an experimenter's structured questions.

Dependent Variables. The quantitative dependent variables measured in this study include: 1) the PWA's *rate* of message access, measured in seconds elapsed from beginning of the communication opportunity until the spoken message is produced; 2) the PWA's percentage

of *accurately activated* conversational elements represented symbolically, 3) the PWA's *communicative independence* during structured conversation, quantified by summing the number of cues generated by the PCP (e.g., "What's this picture about?; I heard you went on a trip some time ago.") or experimenter divided by the number of generative messages produced; and 4) *accuracy of symbol recall* as reflected in the number of correctly sequenced symbols during delayed story retell and number of symbols accessed in response to the experimenter's structured questions.

Data collection. All experimental conversations are videotaped, transcribed, and coded or scored for the dependent variables.

Analysis. Transcriptions are segmented into turns, which are then clustered into communicative exchanges (turns required to convey a single idea). Turns within exchanges are coded for communicative role (initiation, responses) and discourse function. Each exchange is judged as successful, partially successful, or unsuccessful. Number of cues per PWA turn as well as latency of message access will be counted. Intrarater and interrater reliability will be computed for 15% of the data. Scores from all conditions will be compared using descriptive statistics and graphing. In addition, nonparametric statistical analysis (e.g., randomization testing) will determine if there are significant differences in the dependent variables between Conditions A, B, and C when data from all three participants are collapsed. Preference for conditions (Condition D) will be reported descriptively.

Results. Presently, data have been collected for three dyads; preliminary analysis showed better recall of the story sequence for visual scene displays versus traditional grid displays. Preliminary data analysis also suggested that PCPs and PWAs demonstrated increased shared reference, provision of more semantically-specific information and fewer acknowledgements, elaborated comments, increased topic maintenance, and a general impression of more conversational co-construction with visual scene displays than with traditional grid displays or no display conditions. Topic maintenance was also better with both display conditions compared to the no display condition. This poster will discuss performance patterns across subjects, future research directions, and the clinical implications of this investigation. Reasons for elaborated communication with visual scenes versus isolated symbols will also be discussed with regard to the unique language and cognitive constraints experienced by people with severe expressive aphasia.