

Critical Review:
What is the evidence that communication aid devices improve the communicative interactions of individuals with dementia?*

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This critical review examines the evidence regarding the use of communication aid devices and their effects on the conversational performance of individuals with dementia. Four studies were reviewed, totaling 118 individuals with dementia. The study designs included two randomized control trials, and two within group designs. Overall, the evidence gathered from these studies provided suggestive evidence that communication aids including memory aids are effective at enhancing the conversational performance for individuals with dementia. Recommendations for future research and clinical practice are provided.

Introduction

Dementia is a neurodegenerative progressive disorder that can affect various areas including executive function, attention, visuospatial function, language, etcetera (Beukelman, Fager, Ball, & Dietz, 2007). It is hypothesized that the population of individuals with this condition will increase by a considerable amount through the coming years. The progressive nature of this disease can affect the ability of individuals to effectively communicate with their caregivers or other communication partners (Astell et al., 2010). The role of speech-language pathologists in the care and treatment of individuals with dementia is to maximize their communicative functions in order to maintain their daily activities, participation, as well as to preserve their quality of life (Beukelman et al., 2007). Developing and implementing interventions that will facilitate communication between individuals with dementia and their caregivers is an important area of investigation (Astell et al., 2010).

Augmentative and alternative communication (AAC) is a fairly new intervention option for improving conversation in patients with dementia (Fried-Oken et al., 2009). Many of the current AAC interventions being used with this population include low technology communication and memory books and/or high technology support for visual or auditory information that may include computerized aids (Beukelman et al., 2007). These types of communication aids may offer language support as they incorporate stimuli that are highly salient to a person's daily life (Fried-Oken et al., 2009).

Using AAC devices such as memory aids to promote conversational performance and maintain social relationships for individuals with dementia is an

important area of exploration (Beukelman et al., 2007). For example, a hallmark deficit area in patients with dementia is long-term memory (Bourgeois, 2001). Communication devices in the form of memory aids may provide meaningful content in the form of sentences, words, or phrases; pictures; as well as provide access to further information stored in the long-term memory (Bourgeois, 2001). AAC options have been investigated for this population in order to address the difficulties that individuals with dementia (as well as their caregivers) may face in terms of communicating effectively throughout the progression of the disease.

Objectives

The primary objective of this paper is to critically evaluate the existing literature regarding the effects of communication aids on the conversational abilities of individuals with dementia.

Methods

Search Strategy

Articles relating to the topic of interest were found using computer-based databases through the Western Libraries website. The databases included: PubMed, ScienceDirect, Wiley Online Library, and AMED. Search terms included: (Dementia) and (Augmentative Communication) or (AAC) or (Memory Aid) and (Conversation).

Selection Criteria

Studies were selected for inclusion in this critical review when participants had been diagnosed with some form of dementia, an outcome measure of conversational skills was reported, and communication aids were the

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only source of intervention. No limitations were placed on the research design.

Data Collection

Results of the literature search yielded four articles congruent with the aforementioned search criteria. Two of the studies employed a randomized controlled trial design. The other two studies employed a single case series design.

Results

Single Case Series

Single-subject case series designs (level III evidence) are useful for examining interventions that are tailored to the needs of individual patients (Mcpherson et al., 2001). This design may be chosen above group designs because individual differences in response to interventions can be camouflaged when measured in a group. The relationship between interventions and patient behaviours are measured before (i.e. pre-treatment) and after the intervention is provided. This ensures that behaviour changes observed in the participants are due to the intervention itself rather than outside factors. If the results can be consistently demonstrated with various participants or behaviours, then it is more likely that the results are generalizable.

McPherson et al. (2001) evaluated the impact of memory aids in a series of baseline-intervention (A-B) single case experiments on the proportion of time spent on topic in conversation with caregivers. Participants were five nursing home residents who were diagnosed with severe dementia. Interviews took place with the participant's relatives and staff in the nursing homes to identify what type of memory aid would be most appropriate (memory box, memory book, memory poster) as well as what topic materials should be included. An initial baseline phase took place where each participant was observed during 3 conversations with their "key worker". The subsequent intervention (memory aid) phase commenced for each participant after the carer was given brief instruction on how to use the memory aid. The intervention phase was continued for a minimum of three sessions for all participants, and conversations were approximately 10 minutes long (half of the time with the memory aid and the other half without). The order of these segments was alternated across conversations for each participant. For three of the participants, use of a memory aid did not increase the proportion of time spent on-topic. The remaining two participants spent approximately twice as much time on topic when using the memory aid.

Strengths of this study included a plausible rationale as well as a well-formulated research question. Methods involved alternating the order of the intervention (memory aid/no aid) in each conversation to help

eliminate biases. To increase the reliability of the results, a second observer independently observed and coded the participants' conversational abilities. Agreement between the two observers on the second-by-second occurrence of topic-related speech by the participant was calculated using a three-second tolerance interval which is an appropriate statistic as agreement was defined if both observers recorded its occurrence within three seconds of each other. This statistic used for inter-observer agreement corrected for the influence of the 3s tolerance limit (Cohen's kappa). To determine if the memory aid had beneficial effects on conversational performance, the participants' mean percentage time on topic when using the memory aid had to exceed the baseline levels as well as levels without the use of the aid in the intervention phase by more than one standard deviation of the percentage scores obtained without use of the memory aid. Additionally, using the percentage of on-topic conversational time is a straightforward outcome measure.

Limitations of this study included limited selection criteria specified for the participants. This study employed limited statistical measures, thus preventing the authors from stating the significance of the intervention for this population. While the outcome measure is straightforward it does not take into account "memory aid statements" versus novel statements. The authors objectively stated this, however it was not measured throughout the study. The conversations that took place in this study could have been audio recorded and subsequently coded to determine qualitative information. The intervention phase of this experiment was brief and perhaps more improvements would have been demonstrated if participants were taught to use the memory aids or had more practice with them. Additionally, the level of inter-observer reliability in this study was modest. The results suggest that only some individuals with severe dementia can use simple memory aids to improve their conversational performance with carers.

Overall the validity of the evidence provided in regards to the use of memory aids for improving the conversational performance of people with severe dementia was equivocal.

Bourgeois (1993) evaluated the effects of a prosthetic memory aid on the conversational content of three dyads of patients with dementia. This study used a baseline-intervention (A-B) design. Six individuals with moderate to severe dementia with no evidence of other neurologic or psychiatric illness were included in the study. All of these participants had been involved in a prior study in which they received a memory aid.

Familiar individuals of the participants were interviewed to gather personally relevant information. Memory aids consisted of 6-12 personally relevant facts written as simple declarative sentences with corresponding photographs. Dyads took part in 5 minute conversations three times a week. During phases when a memory aid was available, most subjects used their own aid to improve the quality of their conversation (measured on seven different behaviours). Overall, personally relevant memory aids seem to be a beneficial way to improve the quantity and quality of social interactions in people with dementia.

Strengths of the study included the participant eligibility criteria being specified in detail. The research question was well-formulated, and the purpose of the study was clearly stated. The individual transcribing all of the probe sessions and coding for the seven participant behaviours was a research assistant who was trained to do so. In terms of the method of the study, baseline probes were continued until there was stability in subject's performance and the memory aid condition continued until there was an a clear effect in at least one participant's performance. Additionally, inter-observer agreement was 93.9% for all sessions coded for the dyads. Thirteen SLPs (unfamiliar with dyads) rated audiotapes of one randomly selected no-aid and one memory aid session for each dyad for 7 dimensions. One single visual analog scale was used which is sensitive to changes in performance over time and reduced the variance around the scoring without affecting the size of the change score.

Limitations included each of the participants having had prior exposure to memory aids and different histories, thus the results of this study might be influenced by previous experience. Dyad 3 was not included in any of the results or data reported as one of the participants became reluctant to cooperate throughout the experiment. Dyads were also conversing in different environments; although the environments were quiet it is possible that some environments were more distracting than others. Additionally, the changes in the outcome measures of this study can be complex. For example, if a participant increases their number of on topic statements, there is no way to tell whether these statements were shorter or less complex. Moreover, to determine whether they could compare between groups, they could have done an ANOVA statistical test. No statistical analyses were reported in this study and the data was scored and analyzed visually for some measures. Furthermore, it is less functional to determine how two individuals with dementia converse relative to how these individuals converse with carers.

The validity of this study was mildly suggestive in regards to the use of memory aids for improving the conversational performance of dyads with dementia.

Randomized Clinical Trial (RCT)

The remaining articles used RCT design, which has a high level of evidence (level 1). This type of design allocates participants randomly to receive one of several interventions which include a control. In this case, the interventions included communication aids or various aspects of the aids including speech output and various symbol types and the control was no communication aid or no speech output. Randomization helps to avoid any biases and increases the likelihood that differences between groups can be attributed to the intervention provided.

Bourgeois, Dijkstra, Burgio & Allen-Burge (2001)

examined the effects of memory aids on 5-minute conversations between nursing aids and residents with dementia. Nursing home units in seven nursing homes were randomly assigned to treatment and control conditions. This study was part of a larger two-group comparison study that consisted of a 4-week baseline phase, a 2-4 week training phase, a 4 week post-training phase, and a 3 month follow up phase in each nursing home. Residents in the treatment condition were given 12-page memory books consisting of personally relevant autobiographical, daily timetable, and problem solving information. Their assigned nursing aids were trained to use the memory books during interactions throughout the day. The length and quality of verbal interactions between each resident and their nursing aide were measured pre-and post-treatment using computer-based and observational techniques as well as transcriptions of the videotaped conversations. The results demonstrated improvements on several quantitative conversational measures between treatment and control conditions as a function of memory book use. Additionally, the quality of the conversations also improved as a function of memory book use for treatment dyads.

Strengths of this study include a larger sample size (66 participants with dementia and 66 nursing aides) and specific selection criteria for the participants. Furthermore, the computer-assisted measures used a Cohen's kappa for 20% of the conversations inter-observer reliability which was .96. The inter-observer reliability for the conversational measures was .90. A repeated measures analysis of variance (ANOVA) statistic was used appropriately to demonstrate significant changes in the quantity of resident/nursing aid conversational behaviour during the intervention phase. F statistics and p values were also used appropriately to demonstrate qualitative changes in conversation. In addition, this study used correlational

analysis for selected content variables, observational variables, the quality of life difference scores and the MMSE.

Limitations of this study include the fact that differences in nursing aide/dementia patient relationships were not taken into account. The nursing aids were not instructed to interact with the dementia patients in any particular way and thus this leaves variability and room for error. Additionally, trends in expected directions did not reach statistical significance until several variables were grouped for analysis.

Despite these limitations, the evidence is suggestive that memory book use improves the conversational performance of individuals with dementia.

Fried-Oken et al. (2012) examined differences in the conversational performance of individuals with dementia relating to the presence or absence of an aid, types of symbols embedded in the aid, and the presence or absence of voice output. In the first experiment, 30 adults with moderate-to-severe Alzheimer's disease participated in conversations with and without personalized AAC boards. There was no effect of AAC regardless of symbol type, and voice output demonstrated negative effects. In Experiment 2, modified spaced-retrieval training occurred prior to conversations, specified prompts were provided by conversational partners, and semantically-based dependent variables were evaluated. For the 11 participants in the second experiment, there was a significant effect of AAC, showing that the presence of AAC was correlated with greater use of targeted words during personal conversations.

Strengths of this study included a plausible rational and well formulated research question. After analyzing the results of Experiment 1, the researchers made major changes to their study protocol in order to better address their question. Additionally there were specific criteria specified for participants to be involved in the study. Randomization of participants to conditions was employed. The order of control and experimental conditions were systematically alternated from session to session and counterbalanced across participants to control for order effects in both experiments. Appropriate statistics were used including Factorial MANOVAS, and p values to demonstrate significant/non-significant findings. Moreover, the consistency of partner behaviour was taken into account to determine whether the conversational protocol was used consistently across all of the conditions.

Limitations of this study included Experiment 1 being affected by unequal cell sizes for the 6 different conditions. This was related to the fact that

randomization was primarily applied to a larger sample of participants than was initially targeted. In addition, the participants of experiments 1 and 2 differed in terms of language and cognitive skills which might have accounted to the greater success of participants in Experiment 2. Lastly, the procedure could have been outlined in more detail to allow for replication.

Despite these limitations, the validity of the evidence is suggestive that communication aids facilitate the conversational interactions of individuals with dementia.

Discussion

This critical review examined four articles related to the impact of communication aid use on the communicative interactions of individuals with dementia. Overall, there was suggestive evidence that communication aids positively impact various quantitative and qualitative conversational factors for this population.

Two of the four articles included the same author. Thus, any of the methodological weaknesses or biases present in the first study, may have also been incorporated into the second study. A strength of having the same author for two of the articles, however, is that some of the weaknesses mentioned in the first study were addressed and improved in the second study.

A limitation of the research is that most of the studies included various communication partners (ex. relatives, nursing aides, or other individuals with dementia) with varied amounts of communication aid training. This presents difficulties when comparing the use of aids among participants as there are uncontrolled variables between their communication partners that have not been taken into account. It is important that both the participant as well as their conversational partner understand how to use the device properly and receive equivalent training in order to control for these differences during the experiments. It is also difficult to determine what communication aid will be of the most benefit to individuals as they each have unique needs and items to include on their aids.

The McPherson et al. (2001) study looked at individuals with severe dementia only. Other studies were not strict in terms of stage of disease progression and generally included participants that were between the moderate to severe range. It is difficult to determine how disease progression impacts the use of communication aids in conversation. None of the participants received training early in their diagnosis, however, it is possible that individuals who were in the moderate stages of the disease were able to understand and retain the

information they received in terms of training with the communication aid more so than individuals in the more severe range thereby impacting the results of the experiments with both severities present.

Additionally, two studies included various qualitative and quantitative factors of communicative interactions as their outcome measures. However, an increase in some variables does not equate to an improvement in a communicative interaction. For example, a quantitative measure for participants with dementia that was used in Bourgeois et al. (2001) included number of utterances. This outcome measure can be affected by a participant's repetitions or perseverations in a communicative interaction, and does not accurately represent whether a communication aid was beneficial to the conversation.

Further research needs to be completed in the area of communication aid use in the dementia population to better understand how these individuals can communicate effectively throughout the progression of their disease. Research may also focus on communication aid use to improve overall quality of life for individuals with dementia.

Recommendations

Future research should address the following factors:

- i. Longitudinal studies looking at training with communication aids early after dementia diagnosis and followed through the progression of the disease
- ii. Effectiveness of using communication aids with various types of dementia (e.g. vascular, lewy-body, fronto-temporal, etc.)
- iii. Generalized effects of communication/memory aids in various environments with various communication partners

Clinical Implications

More research needs to be completed, however, there was some evidence in the literature to suggest that communication aids can have a positive effect on the communicative interactions of some individuals with dementia. This is important when speech-language pathologists are determining how best to intervene with patients with dementia and how to provide them with a more functional means of communication. The speech-

language pathologist should keep in mind that the communication aid used with these individuals should be highly personalized and salient for the client in order to provide them with optimal benefits.

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