INTRODUCTION

Word-finding difficulty, a hallmark of aphasia, can substantially affect communication. Individuals with Wernicke's type aphasia exhibit discourse characterized by word-retrieval impairments including neologisms and paraphasias (M. Nicholas, Obler, Albert, & Helm-Estabrooks, 1985; Silver & Halpern, 1992). Recently, evidence suggests that discourse level treatments improve word-retrieval processing in people with aphasia (for a review, see Boyle, 2011). The current feasibility study examined the use of a cognitive-linguistic discourse therapy, Attentive Reading and Constrained Summarization (ARCS) (Rogalski & Edmonds, 2008), as a means of improving word retrieval in two women with Wernicke's type aphasia.

ARCS targets linguistic processes at the discourse level (macro-structure), unlike treatments that may target language at the word or sentence level (micro-structure). The therapy requires reading aloud with the intention of summarizing, then summarizing aloud while constraining the use of non-informative words (e.g., "thing" or "stuff"), pronouns, or opinion. ARCS was found to increase word finding in a gentleman with primary progressive aphasia whose discourse was characterized by word-retrieval impairments, paraphasias, and tangential language. The women in the current study, "Nancy" and "Betty," had stroke-related Wernicke's type aphasia and exhibited empty speech marked by word-finding difficulty, paraphasias and tangents –a constellation of discourse and naming characteristics similar to the gentleman's in the original study. Moreover, as with the original study, these women received treatment as part of their regularly scheduled clinic hours.

Given the word-finding and discourse similarities between the original case study and the women in the current study, we examined the feasibility of using ARCS to treat word-retrieval impairments in Wernicke's type aphasia. We hypothesized pre-post treatment increases in naming performance for both women. Secondarily, since the ARCS treatment requires reading out loud as part of its protocol, we explored the effect of ARCS on reading errors. Since repeat reading of sentences and paragraphs has resulted in improved reading in individuals with alexia (Cherney, 2004), we anticipated a pre-post treatment reduction in reading errors for our clients.

METHODS

Participants. Nancy, a 63 year old woman (3.5 years post-onset left CVA) and Betty, an 83 year old woman (20 years post-onset left CVA) participated as part of their regularly scheduled clinic services. Both women were classified with Wernicke's type aphasia (Nancy = moderate, Betty = moderate-severe) according to the Western Aphasia Battery (WAB). Both had severe naming impairments as indicated by pre-treatment Boston Naming Test (BNT) scores (Nancy = 7/60, Betty = 11/60). A reading and summarizing effectiveness survey (RSES) designed for this study indicated that both women had self-rated moderate impairments reading and summarizing in a variety of communicative contexts. See Table 1 for a complete list of pre-therapy measures. Notably, Betty had a bilateral mild-sloping-to-severe sensorineural hearing loss and oral reading marked by frequent phonemic paralexias.

Stimuli. Therapy stimuli were abridged versions of news stories about a variety of topics (e.g., adventure, health) downloaded from the "Learning Resources" website http://www.literacynet.org/cnnsf/home.html. Both clients received the same stories.

Therapy Protocol. ARCS was modified somewhat from the original version (in Rogalski & Edmonds, 2008). Clients 1) read the whole passage aloud, 2) read one sentence aloud with the intention of summarizing, 3) summarized the sentence from memory with the following constraints: no pronouns, no non-information words, no opinion or tangential information, 4) reread the sentence to check for errors, 5) continued to read, summarize, then reread subsequent

sentences, and 6) summarized the entire passage using the above-outlined constraints. Given Betty's hearing impairment and oral reading errors, modifications were made, including using an FM system to aid with clinician directions and a visual cueing system for phonological breakdowns in reading (Greenwood, Grassly, Hickin, & Best, 2010).

Procedure. Both clients were evaluated and treated separately by two master's level student clinicians supervised by the first author as part of their practicum assignments. Prior to and at the conclusion of therapy, clients were evaluated on standardized and unstandardized measures (see Table 1). Clients were also tested on their ability to summarize four untrained reading passages: each passage was read aloud once then summarized once from memory. In therapy, clients completed 1-hour sessions, 2-3 times per week for a total of 18 sessions during the spring 2011 semester. No more than one article was completed per session. For homework, clients were encouraged, but not required, to continue practicing reading aloud and summarizing that day's article. Two months post-treatment, clients were re-tested on their ability to read once then summarize four untrained reading passages.

Scoring. Discourse measures were transcribed verbatim and analyzed using Nicholas and Brookshire's (1993) percent Correct Information Unit (%CIU) system, a method used to monitor changes of informativeness in the connected speech of individuals with aphasia. Percentage of reading errors were calculated as #word errors/total #words.

RESULTS

Post treatment evaluation (see Table 1) indicated little to no change for either client on the WAB AQ and picture description measures. However, Nancy increased her BNT score by 128.57%, her WAB LQ by19.33%, and her RSES by 43.75%; whereas Betty showed very little change on these measures. Post treatment results from reading untrained passages once then summarizing them from memory indicated Nancy increased her %CIU scores by 19.7% and decreased her percentage of reading errors by 51.3%. Again, Betty's scores on these measures indicated little to no change. Two months post-treatment results showed maintenance of %CIU measures and slight increases in percentage of reading errors for both clients.

DISCUSSION

Our hypotheses that ARCS would increase word-finding ability and decrease reading errors in individuals with Wernicke's type aphasia was supported for one participant, Nancy, but not for the other, Betty. Nancy exhibited some dramatic improvements on word-finding measures and post-treatment maintenance of %CIUs, as well as decreases in reading errors. Additionally, her WAB LQ scores increased, as did her self-reported perception of reading and summarizing ability (RSES). Improvements in Nancy's word-finding using ARCS may be supported by the complexity account of treatment efficacy theory (CATE) (Thompson, Shapiro, Kiran, & Sobecks, 2003), where treating more complex processes (e.g., discourse) generalizes to simpler forms (e.g., naming). A decrease in Nancy's reading errors is consistent with the ORLA approach of repeated reading aloud of sentences and paragraphs (Cherney, 2004).

Individual differences may best account for the large discrepancy in treatment effect between Nancy and Betty. Several factors indicate that Betty may have been a poor candidate for the treatment. According to Kelley and Borazanci (2009), factors negatively impacting progress in therapy include advanced age, low motivation, and social isolation. Indeed, at 83 years old, Betty was 20 years Nancy's senior. Betty was also much less motivated than Nancy, self-reporting that although she enjoyed therapy, she saw little point in improving her communication since she lives alone and does not have an active social life. Finally, Betty's pre-treatment WAB LQ scores were lower than Nancy's and she exhibited more phonological errors during reading,

suggesting that Betty's reading impairments may have been too severe for ARCS to provide benefit. Future studies should better control for reading ability and demographic and personality features that might limit ARCS' use as a potential therapy.

In sum, ARCS adds to the literature that discourse-level treatments can improve word-retrieval processing in people with aphasia (Boyle, 2011), but there is a need for further exploration of the type of candidate for whom ARCS would be optimum.

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Table 1. *Pre-post treatment measures*

Test/Measure	Nancy		Betty	
	Pre	Post	Pre	Post
BNT[a] (60)	7	16	11	11
WAB AQ[b] (100)	64.1	64.6	41.1	44.2
WAB LQ[c] (100)	55.98	66.8	47	47
Nicholas & Brookshire Picture Description Task %CIU	70.75%	73%	68%	70%
RSES [d] (40)	24	34.5	19	22

[a]Boston Naming Test

[b]Western Aphasia Battery Aphasia Quotient

[c]Western Aphasia Battery Language Quotient

[d]Reading and Summarizing Effectiveness Survey

Figure 1. *Average percentage correct information units (%CIUs) measured in four untrained article summaries pre-, post-, and two months post ARCS treatment. Each article was read aloud once, and then summarized once from memory.*
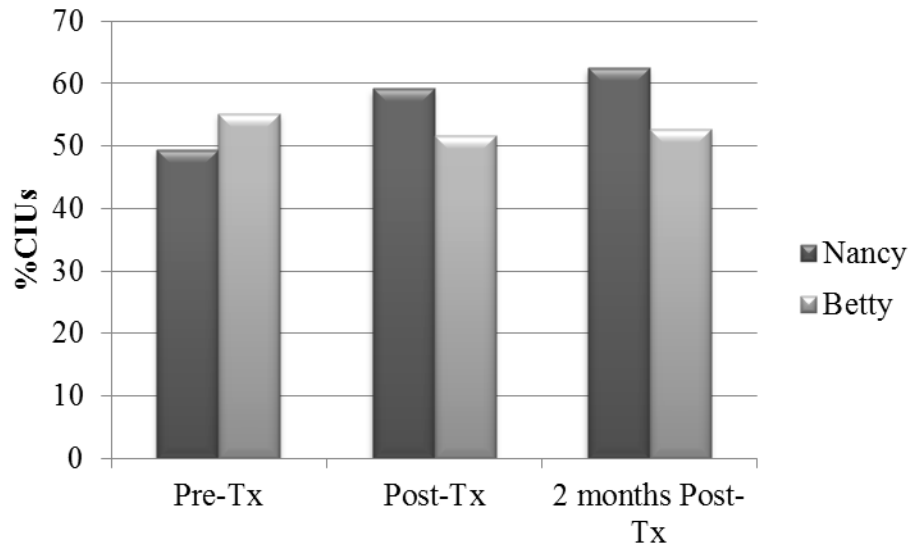

Figure 2. *Average percentage of reading errors measured in four untrained article summaries pre-, post-, and two months post ARCS treatment.*