

## Abstract

The purpose of the research was to explore a combined semantic + multimodal communication program (S+MCP) for an individual with chronic moderate-severe aphasia with coexisting semantic deficits. The effect of S+MCP on his ability to switch between modalities when an initial communication attempt failed was examined during a referential communication task and administration of the CADL-2 with modified scoring. The participant demonstrated increased switching behavior between modalities during both tasks, and increased use of combined modalities (e.g., verbal plus gesture). Clinical implications and future research are discussed.

## Effects of Semantic + Multimodal Communication Program for Switching Behavior in Moderate-Severe Aphasia

Word retrieval deficits are a hallmark characteristic of aphasia. According to a model of lexical retrieval hypothesized by Dell and colleagues (2004), retrieval of an object name involves a two-step process: 1) lemma access, the connection of a concept to a semantic representation of a word, and 2) phonological access, connecting the lemma to the phonological form of the word resulting in verbal expression. Many clinicians provide instruction in alternative modalities to compensate for deficits in the second step. Multimodal interventions incorporating many alternative modalities may be introduced to improve overall communicative effectiveness (e.g., Rodriguez, Raymer & Rothi, 2006). Despite the ability of people with aphasia to learn to produce their alternative modalities, some people may not attempt to switch to an alternate communication modality when verbal output fails (Purdy, Duffy, & Coelho, 1994).

A Multimodal Communication Program (MCP) was developed to teach communication modalities simultaneously to improve the ability of people with aphasia to switch to an alternate modality when a communication attempt fails (Purdy & VanDyke, 2011). Preliminary investigations of MCP revealed that coexisting semantic deficits may affect the outcome. The purpose of the current study was to investigate the efficacy of a combined semantic and multimodal communication program (S+MCP) for people with moderate-severe aphasia that exhibit semantic deficits. S+MCP aims to address deficits the both steps of lexical access to improve the overall communicative effectiveness through increased alternative modality production and switching behavior.

### Method

#### Participant

The participant was a 77-year-old male with chronic severe global aphasia resulting from a single left-hemisphere stroke. The participant was a native speaker of American English, right-handed prior to the stroke, and passed vision and hearing screenings. He also had a documented semantic impairment as determined by a raw score below 40 out of a 52 on the *Pyramids and Palm Trees Test (PPT)* (Howard & Patterson, 1992). Table 1 contains the participant's demographic information and initial assessment data.

#### Materials

Thirty target nouns commonly used in American English were randomly divided into three lists of ten words each and were represented by three image sets. One set of 30 colored line drawings was used by the communication partner during the Referential Communication Task (RCT) probes and during the S+MCP treatment sessions. A second set of 30 colored line drawings was used to create three communication boards consisting of two horizontal rows of five items each printed on standard letter paper. The examiner showed a third set of 30 color photographs representing all target words to the participant during the RCT. White 4X6 inch index cards containing written text of treated words, semantic features, and semantic feature foils in 32 point Arial font were used during semantic treatment. The participant had access to paper and a marker during all sessions.

## **Experimental Design and Procedure**

The researchers implemented a multiple baseline design across stimuli (word lists) to examine the affects of S+MCP on participants' switching behavior. The dependent variable was the RCT communicative flexibility score defined as the percentage of successful modality switches out of the total number of opportunities to switch modalities. A secondary dependent variable was the CADL-2 communicative flexibility score (Purdy & Koch, 2006) measured pre and post intervention. Experimental sessions included baseline, intervention and post-intervention sessions.

First, formal assessments were administered across five baseline sessions. The participant completed the RCT probe with all 30 words during each baseline session and prior to the first treatment session for a total of six pretreatment probes.

The RCT probe involved the examiner, the participant, and a trained communication partner. The examiner presented a photograph depicting a target word to the participant. The participant was instructed to communicate the word to the communication partner who was unable to see the photograph. Pen and paper for writing and drawing, as well as a communication board were available to the participant. Following the initial production by the participant, the communication partner presented either a correct or incorrect colored line drawing based on the response of the participant and whether it was an item predetermined to promote switching behavior. To promote switching behavior by the participant, the communication partner purposefully provided an incorrect item 50% of the time (5 target words from each list) regardless of the participant's response. The purpose of the RCT was to determine if the participant was able to switch modalities to repair a communication breakdown that occurred during the first communication attempt.

Each intervention session began with the RCT probe. Treatment sessions included two phases; during each phase the examiner provided treatment for ten words on one treatment word list (Treatment list 1 or Treatment list 2). The participant completed a semantic treatment followed by MCP for each treated word prior to proceeding to the subsequent word.

For the semantic treatment, the examiner presented the participant with a colored line drawing of the target word paired with orthographic representation of the target word. The participant was presented with three features: one related to the target word and two unrelated foils. The examiner read each feature answer choice and requested that the participant place the correct semantic feature with the target word. The participant sorted the target word three times, once for each of three types of semantic features: category, location, and property.

MCP began with presentation of a colored line drawing depicting one of the 10 treated words. The examiner modeled each of three modalities to depict the pictured concept. After the participant imitated each behavior, he was instructed to produce the three modalities for the target word, given verbal or gestural cueing as needed. Then, the participant produced all three modalities a second time in a communicative scenario with the examiner. Based on performance during the RCT and the participant and caregiver's stated preference, the researchers selected

speaking, pointing to the communication board, gesturing, and drawing as intervention modalities.

After completion of the two phases of intervention, the participant completed three sessions of post-treatment assessments and the RCT probe. The participant completed the RCT and an assessment of his ability to produce each modality for each target word during each of the three post-intervention sessions.

### **Results**

Following S+MCP, the participant demonstrated increased switching behavior during the RCT probe and CADL-2. Communicative flexibility scores during RCT probes and CADL-2 are available in Figures 1 and 2, respectively. Unexpectedly, the researchers also observed changes in the frequency with which the participant combined communication modalities following MCP (speaking and gesturing simultaneously). Figure 3 shows the changes in the participant's use of combined modalities. Finally, Table 2 contains the participant's pre/post assessment data.

### **Discussion**

The results suggest that for some people with aphasia who have significant semantic impairments, a combined S+MCP intervention may increase switching among alternative modalities to repair communication breakdowns. However, as evidenced by the delayed increase in switching behavior, the researchers concluded that some people might need additional intervention sessions to master switching behavior in a communicative task. Finally, further investigation of various aspects of communicative flexibility is warranted given the unexpected increase in combined modality use.

## References

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Table 1  
*Participant Characteristics*

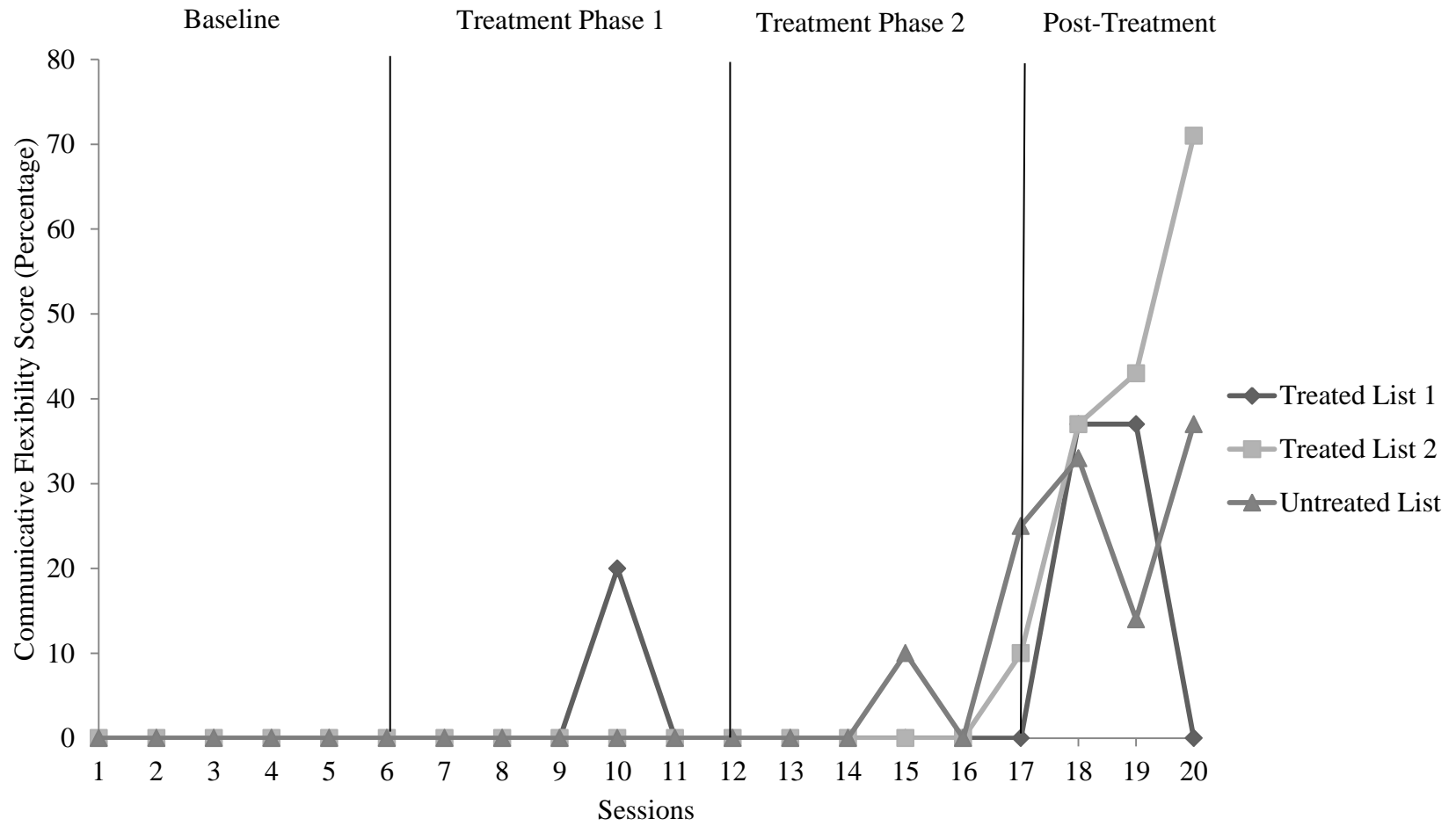
Western Aphasia Battery—Revised (Aphasia Quotient)	19.7
Pyramids and Palm Trees Test	28/52
Time Post Stroke	15 months
Motor Status	Right hemiparesis; Ambulatory
Education	16 years
Cognitive Linguistic Quick Test	
Clock Drawing Subtest	1/13
Symbol Trails Subtest	0/10
Reading Comprehension Battery for Aphasia	
Subtest I: Word—Visual	6/10
Subtest II: Word—Auditory	6/10

Table 2  
*Pre- and Post-Treatment Test Scores*

	<b>Baseline</b>	<b>Post-Treatment</b>
Communicative Activities of Daily Living-2	35/100	30/100
Pyramids and Palm Trees Test	28/52	44/52
Weschler Memory Scale-III: Spatial Span Subtest*		
Forward	4/16	4/16
Backward	4/16	3/16
Psycholinguistic Assessment of Language Processing in Aphasia	19/40	22/40
Subtest 47: Spoken Word Picture Matching	16/40	14/40
Subtest 48: Written Word Picture Matching	4/15	4/15
Subtest 51: Word Semantic Association—High Imageability Words		
Raven's Coloured Progressive Matrices	29/37	27/37

\*Used as a control measure as the researchers did not expect S+MCP to affect the participant's memory.

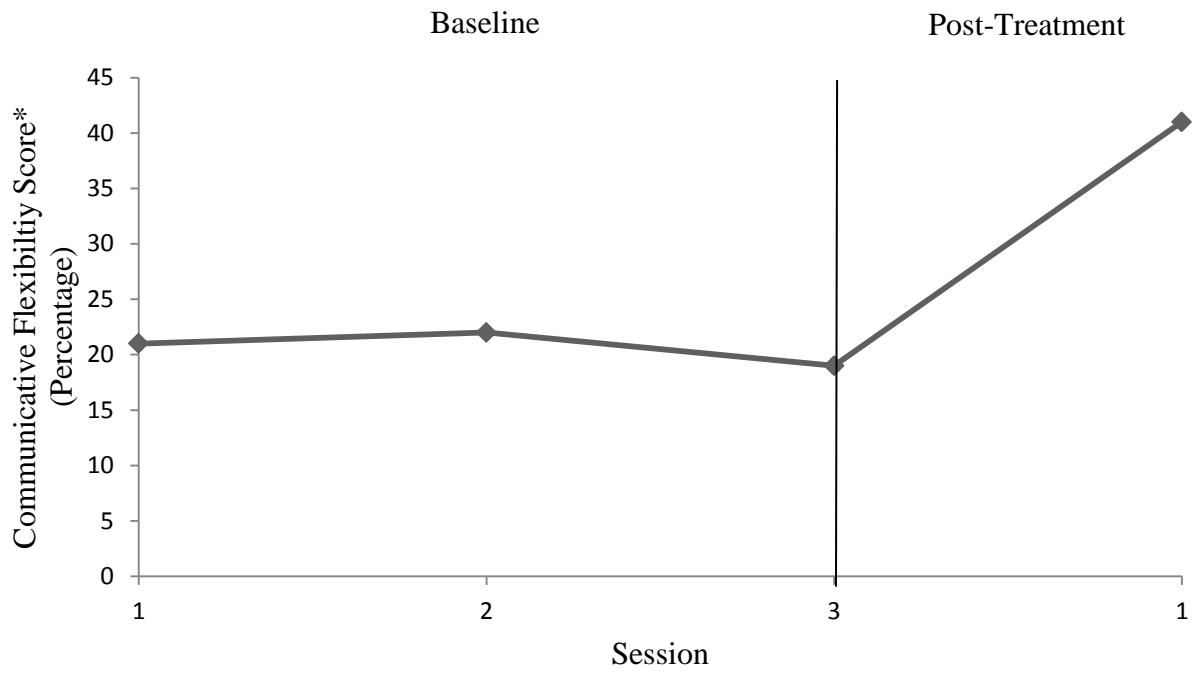
Figure 1  
*Participant's Communicative Flexibility Scores on RCT*



\*Commutative flexibility score = number of modality switches out of the number of opportunities to switch.



Figure 2  
*Participant's Communicative Flexibility Scores on CADL-2*



\*Communicative flexibility score = number of modality switches out of the number of opportunities to switch.

Figure 3

*Participant's Use of Combined Modalities During the RCT Probe across word lists*

