

## Long-term effectiveness of PROMPT treatment in a severely apractic-aphasic speaker

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### Abstract

This study examined the acquisition and long-term maintenance of a functional core vocabulary by a severely apractic-aphasic speaker following the application of Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT) treatment. The subject was a 24-year-old male who had suffered a single left-hemisphere thrombotic CVA approximately 2 years prior to the beginning of this investigation. Treatment and maintenance were monitored over a 41-week period. The results showed that the 30 target words and phrases were produced accurately during the treatment phases of the study and after treatment was discontinued.

### Introduction

The Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT) procedure is a tactile-based programme that uses a combination of proprioceptive, pressure, and kinaesthetic cues in the treatment of motor speech disorders (Square-Storer and Hayden 1989). These tactile cues are designed to provide apractic patients with sensory input regarding place of articulatory contact, extent of mandibular opening, voice, tension, relative timing of segments, manner of articulation, and coarticulation.

The first application of the PROMPT system was in children with developmental apraxia of speech (Chumpelik 1984). Two later studies suggested that PROMPT cueing could be effective in facilitating the verbal productions of adults with chronic apraxia and aphasia (Square *et al.* 1985, 1986). Although these results with adult subjects were encouraging, the studies were problematic. The first study (Square *et al.* 1985) utilized an uncontrolled simultaneous treatment design to compare PROMPT treatment with another type of intervention. The second study (Square *et al.* 1986) used such a small number of target words ( $n = 3$ ) and phrases ( $n = 2$  for subject P. W.;  $n = 1$  for subject R. J.) that it was difficult to determine whether PROMPT could be used to build a functional core vocabulary. As a result of these difficulties the clinical effectiveness of PROMPT as a treatment with apractic-aphasic adults was unclear.

Accordingly, the current study utilized a modified multiple-baseline design to:  
(a) measure the effects of systematically teaching a core vocabulary of 30 functional

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words and phrases to a severely apractic-aphasic subject via PROMPT treatment and (b) monitor the maintenance of any treatment gains over an extended period of months.

## Methods

### *Subject*

The subject (J. S.) was a 24-year-old male construction worker who experienced the sudden onset of seizure, aphasia, and right hemiplegia on 10 March 1992. He was diagnosed as having suffered a left-hemisphere cerebrovascular accident (CVA) secondary to fibromuscular dysplasia. Following his CVA, J. S. underwent nearly 1 year of inpatient and outpatient rehabilitation. According to family reports he could verbally produce five words in appropriate contexts at the end of his speech-language treatment ('yes', 'no', 'hi', 'thanks', and 'hey').

J. S. began the current study approximately 18 months after speech-language treatment had been discontinued. An initial evaluation revealed that his verbal productions were still extremely limited. Aside from producing the five words mentioned previously, J. S. was able to repeat single-syllable words that had visible initial phonemes (e.g. /b/, /p/, /m/, /f/, and /v/) on approximately 15% of attempts. On the Motor Speech Evaluation (Wertz *et al.* 1984), J. S. was able only to prolong vowels. All other attempts at speech production on this test were unsuccessful due primarily to severe articulatory groping for initial phoneme placement. Some perseverative and anticipatory errors were also evident. J. S.'s language deficits were consistent with the diagnosis of aphasia as shown by his performance on the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan 1983). J. S. indicated a strong desire to become as verbal as possible, and was willing to forgo other treatment options during this study. Table 1 lists communication and cognitive test data on the subject.

### *Experimental stimuli*

The experimental stimuli consisted of 30 functional, personally relevant words and short phrases selected by J. S. and his family. Colour drawings served as visual stimuli for most of these target words and phrases. For the target items not readily pictured, verbal questions were used to elicit responses from J. S. (e.g. 'What is your last name?'). The 30 words were divided into six treatment sets, each containing five items. Initially, these words were to be randomly assigned to the treatment sets. However, pilot treatment sessions revealed that J. S. frequently made severe perseverative errors when target words with the same initial phoneme were in the same treatment set. These errors were persistent, even while the PROMPT cues were being applied. Consequently, the 30 words were grouped according to J. S.'s preference. It should be noted, however, that as the study progressed these perseverative errors seemed to lessen. By treatment set 5, for instance, J. S. was able to work with two words beginning with initial /h/. The Appendix lists all 30 target words and phrases within their treatment sets.

Table 1. Complete subject data

<i>Porch Index of Communicative Ability</i> (Porch 1981)		
	Percentile	Mean
Overall	43	10.3
Writing	33	5.2
Copying	89	14.3
Reading	41	11.1
Pantomime	98	14.7
Verbal	27	6.5
Verbal Subtest I	24/29	5.0
Verbal Subtest IV	29	5.6
Verbal Subtest IX	33	6.7
Verbal Subtest XII	24	8.6
Auditory	50	14.2
Visual	35-99	15.0
<i>Boston Diagnostic Aphasia Examination</i> (Goodglass and Kaplan 1983)		
	Raw score/Total possible	
Auditory Comprehension		
Word discrimination	32.5/72	
Body-part identification	8/36	
Commands	12/15	
Complex ideational material	6/12	
Oral Expression		
Automatized sequences	0/8	
Repetition of words	2/10	
Repeating phrases	0/16	
Word reading	0/30	
Responsive naming	0/30	
Visual confrontation naming	0/114	
Understanding Written Language		
Symbol and word discrimination	10/10	
Word recognition	1/8	
Comprehension of oral reading	0/8	
Word-picture matching	5/10	
Reading sentences and paragraphs	0/10	
Writing		
Mechanics of writing	4/5	
Recall of written symbols	0/47	
<i>Peabody Picture Vocabulary Test</i> (Dunn and Dunn 1981)		
Form L: 24th percentile	Raw score 143/175	
<i>Coloured Progressive Matrices</i> (Raven 1962)		
	Total score 34/36	
<i>Pyramids and Palm Trees Test</i> (Howard and Patterson 1992)		
Three-picture version	Total correct 48/52	
<i>Wechsler Memory Scale-Revised</i> (Wechsler 1987)		
Figural memory	Raw score 5/10	
Visual paired associates	Raw score 6/18	
Verbal paired associates	Not testable	

### *Procedures*

#### *Baseline data collection*

A single, initial baseline probe was completed on all 30 target words prior to beginning PROMPT treatment with the first treatment set. On this baseline probe J.S. was presented with either the colour drawings or the verbal questions associated with the target words. He was then asked to name the pictured items or answer the questions. No cues on the productions of the words, or feedback on the accuracy of the responses, was given during this probe. All responses were scored as either correct or incorrect. To be scored as correct each phoneme in the target word or phrase had to be articulated accurately, and be in the correct order, based on a broad phonetic transcription of the response. Multiple attempts at the target words were allowed, and self-corrections were scored as correct. While this scoring system may appear to be too stringent for a subject so verbally impaired, pilot treatment sessions with J.S. indicated that a majority of his verbal productions following PROMPT cueing were quite good. Consequently, it was determined to hold him to a relatively high standard of accuracy during the study.

Three additional baseline probes were completed before each set of target words entered the treatment phase of the study. The administration of these three probes was identical to the initial baseline probe. The presentation order was randomized between probes. All three probes were conducted during a single session, spaced over a 50-minute period. This overall schedule of baseline measurement is less than that found customarily in a multiple-baseline design, but it was nevertheless utilized in this study to minimize the effects of over-probing the target words during treatment. It must be acknowledged that sequencing baseline data collection in this manner compromised the experimental rigour of a true multiple-baseline design, which requires extended probes of untreated behaviours throughout the entire baseline phase. Furthermore, administering three baseline probes over a single 50-minute period did not control for the variable day-to-day naming accuracy often demonstrated by aphasic subjects (Freed *et al.* 1996). While recognizing these methodological compromises, it was still determined that the current baseline procedure resulted in an accurate representation of J.S.'s ability to verbally produce the untrained items.

#### *Treatment*

All treatment sessions were conducted by the first author. The treatment procedure followed the sequence described by Square *et al.* (1986). The clinician verbally presented a target word from a treatment set, and J.S. attempted to repeat it. If correct, the next trial on that word was presented. If incorrect, the clinician presented the PROMPT cues that focused on J.S.'s errors, and he again attempted to produce the target word. Approximately 20 trials for each of the five target words were completed in each session. Treatment sessions were conducted twice weekly and lasted 50 minutes. Once each week, treatment probes were administered to measure J.S.'s ability to verbally produce the target words without cues. The administration of these probes was identical to the baseline probes; however, the number of items probed increased in increments of five as J.S. moved through the treatment sets. The criterion for advancing to the next treatment set of target words was 80% accuracy over two consecutive sessions.

### *Maintenance*

Once the 80% criterion for a treatment set was met, the five words in that set were moved into the maintenance phase of the study. This phase contained two main elements. First, the words in maintenance were recorded onto Language Master cards for home use. J. S. was asked to verbally repeat the words on the cards at least once a day, preferably more often. His mother informally monitored his daily use of the cards. Second, family members and friends strongly encouraged J. S. to produce the target words in appropriate contexts on a frequent basis. To accomplish this, the family was given many examples of how the target words might be elicited in context. For example, at the dinner table, J. S. would be required to say 'milk' before it would be passed to him. The family was encouraged to always be conscious of natural situations in their day-to-day routine where they could logically ask J. S. to verbally produce the target words. During the study, feedback from J. S. and his mother indicated that the Language Master activities and the 'in-context' speech requirements were being implemented properly.

Weekly maintenance probes were administered to measure J. S.'s ability to produce the target words after treatment had been discontinued. The administration procedure for the maintenance probes was identical to that for the baseline probes. As with the training probes, the number of words probed increased as J. S. moved to new treatment sets.

### *Reliability*

Approximately 25% of the probes were recorded on audiotape. Point-to-point inter-rater reliability on these responses was 88%.

## **Results**

Figure 1 illustrates the data from the baseline, treatment, and maintenance probes. It shows that the 80% treatment criterion was met for all sets of target words. The overall mean score on the maintenance probes was 78.2% (range 68.3% for set 6 to 84.1% for set 1). All maintenance probe scores remained above baseline scores throughout the study. Although generalization to untreated target words did not appear on the baseline probes, family reports and clinical observations did reveal that J. S. was verbally producing 10–12 untreated non-target words in appropriate contexts at the end of the study (e.g. 'money', 'God', 'woman').

## **Discussion**

The findings of this study indicate that PROMPT cueing can be an effective method of facilitating the verbal productions of a severely apractic-aphasic speaker. At the study's completion all of J. S.'s productions of the target words were very intelligible. Overall, only minor phonetic distortions were evident. The 78.2% overall maintenance probe accuracy seemed to approximate his correct productions of the target words outside the clinic. Difficulty with initial phoneme placement remained his predominant articulatory problem during and after the study.

Clinical observations supported Square-Storer's (1989) hypothesis that PROMPT treatment is effective because the clinician acts as an external

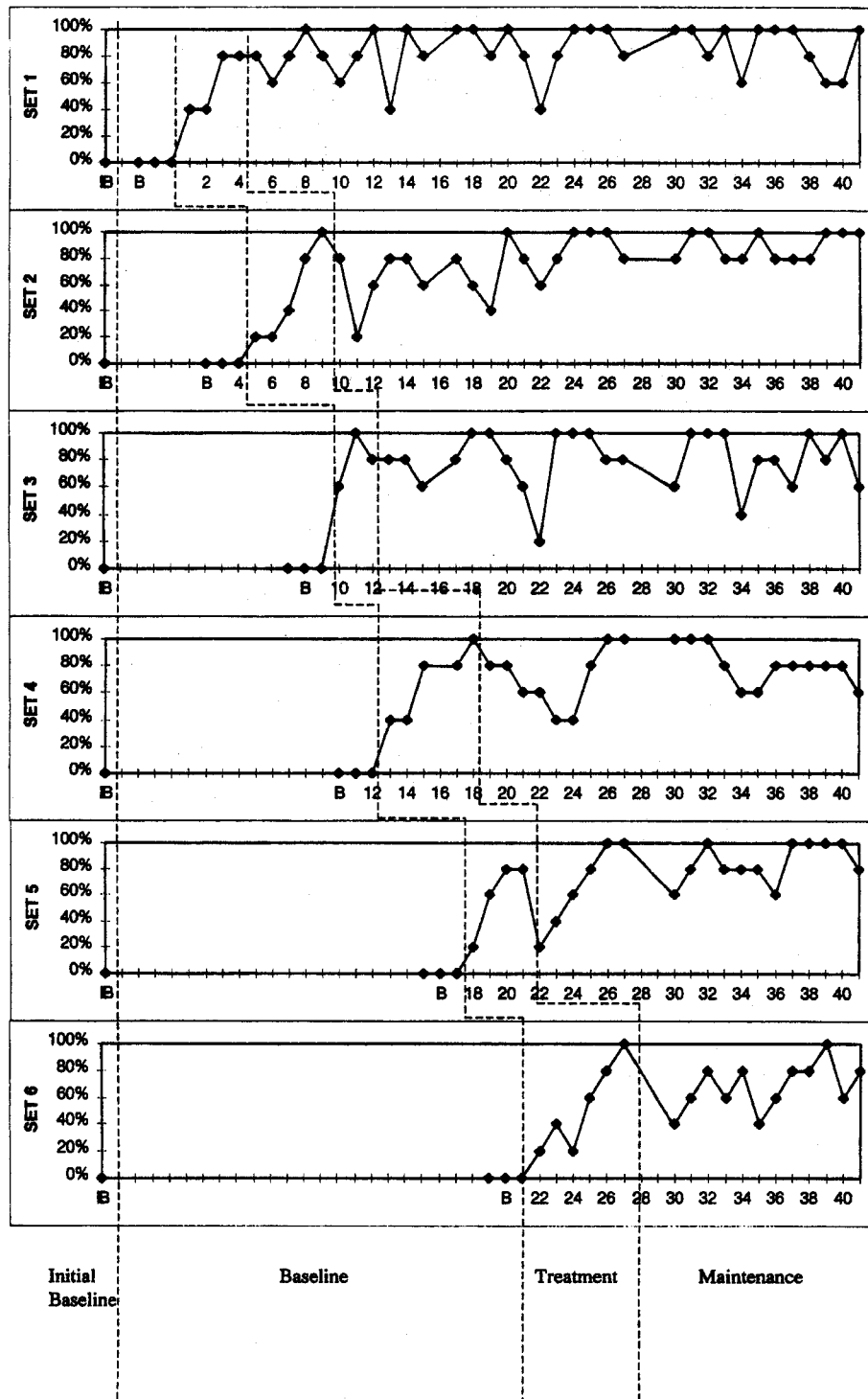


Figure 1. J. S.'s total percentage correct on the initial baseline, baseline, treatment, and maintenance probes. Data were not collected on weeks 16, 28, and 29. *Note:* The three baseline data points were collected during a single session, spaced over a 50-minute period.

programmer who maps the motor sequence for the patient. J. S. responded well to the 'hands-on' articulatory guidance provided by the PROMPT cues. Furthermore, the many repetitions of every target word during each treatment session helped J. S. to consolidate the effects of the cues. It must be mentioned that

PROMPT cueing can become quite complex, both for the subject and the clinician. In this study only the most simple and direct cues were required by J. S. during treatment. All of his cues focused on the manner, place, and voice of initial consonants and, to a lesser extent, the degree of mandibular opening for medial vowels. The more elaborate PROMPT cues, which require special clinician training, were never needed by J. S. to produce a target word correctly.

Although J. S. remained motivated throughout the weeks of treatment, and was pleased with his progress, PROMPT is a labour-intensive procedure that may not be suitable for every apractic-aphasic patient. Unlike J. S., some patients might react negatively to the frequent manipulations of their articulators by the clinician. Others would not have the patience for the many drill-like repetitions of the target words in treatment. Perhaps less intrusive modifications of the cues could maintain the effectiveness of the treatment procedure and widen its appeal to other patients. For J. S., however, the benefits outweighed the drawbacks because he was speaking new words clearly for the first time in over 2 years. The most unanticipated result of this study was J. S.'s ability to use the target words in totally unique situations. For example, his mother described an incident during a windstorm in which a live powerline had fallen to the ground next to their house and caused a small fire. J. S. was alone when this occurred, but he was able to call the emergency number 911 to report his name, 'help me', and 'fire'. There were many other similar reports of J. S. using the target words in a variety of settings.

This success with treatment carry-over and maintenance is thought to be largely the result of the family's insistence that J. S. use the target words in appropriate contexts. The importance of family involvement in the maintenance of J. S.'s treatment gains became evident about a month after the end of this study. On his own initiative J. S. moved into a small apartment, approximately 25 miles from his family's residence. As a result he had much less contact with others, and fewer occasions to practise speaking in functional situations. Although J. S. stated that he continued to use the Language Master as frequently as he had previously, it was soon noted in clinic that he was demonstrating less maintenance of treatment gains compared to when he was living with his family. The decrease in accurate productions occurred primarily on new words taught with PROMPT cues, but it was also evident to a lesser degree on certain target words mastered earlier during the study. This sequence of events also suggests that the Language Master activities were of less importance to his maintenance of target words than were family involvement and his opportunities to produce the words functionally. While this slowing of progress must be seen as a setback for J. S., it is clear that the vocabulary he gained from PROMPT cueing has had a positive impact on his ability to communicate with others.

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### Appendix: The 30 target words and phrases used in the study

#### Set 1

1. food
2. Mom
3. pants
4. J\*\*\*
5. help me

#### Set 2

1. car
2. S\*\*\*
3. Jammie
4. milk
5. fire

#### Set 3

1. home
2. water
3. Kareena
4. hurry
5. Ken

#### Set 4

1. bathroom
2. Whopper
3. big milkshake
4. gas
5. eat

#### Set 5

1. hello
2. one minute
3. how are you?
4. fine
5. wait for me

#### Set 6

1. drink
2. root beer
3. keys
4. why?
5. Dawna