

# An Environmental Manipulation Approach to Treating Apraxia of Speech

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## STATEMENT OF PROBLEM

As our profession has matured, we have developed improved and innovative diagnostic and prognostic measures for the poststroke patient. We have been offered reports of a variety of methods for instating or strengthening behavior. However, reports of the overall environmental transfer and impact of our training are difficult to find. This type of documentation becomes of critical importance when one attempts to solicit third party support from an agency such as the Bureau of Vocational Rehabilitation or Medicare, or when attempting to influence physicians or legislators to establish priorities for speech pathology intervention as a critical and significant rehabilitation service. More importantly, a communication disorder can become the single largest obstacle preventing the patient from returning to work and his prestroke activity. Without addressing the overall anticipated impact of intervention in the patient's life system, we can spend enormous energy on exercises and drills that may never improve the patient's out-of-clinic interactions. Thus transfer and generalization become paramount in making therapy significant for the patient. To maximize the opportunity for these processes to take place, we have arranged for therapy to occur in the home within the patient's normal communicative contexts. In this paper the behavioral assessment for three patients, the subsequent environmentally focused intervention strategies, and the resulting impact of the services will be presented.

Patient 1. Patient 1 presented with frequent apraxic errors and no notable aphasia, as shown in Table 1. Her speech apraxia was severe enough to reduce intelligibility and cause great frustration. As a result the patient became extremely uncommunicative. Baseline MLU was 2.6 in the clinic and 3.4 in the home while communicative success was measured at 68 percent in the clinic and 40 percent at home.

Table 1. Data summary for Patient 1.

Age: 71	Premorbid Vocation: French Teacher		
Sex: F	Education: M.A.		
Mo. post onset: 6 months	Previous Therapy: Yes		
		<u>*Pre Stroke</u>	<u>Post Stroke</u>
A. WAIS			
1. Verbal I.Q.		129	119
2. Performance I.Q.		114	112
3. Full Scale I.Q.		124	117
B. PICA		<u>Pre Treatment</u>	<u>Post Treatment</u>
1. Gestural		14.89	
2. Verbal		13.18	

\*Data obtained pre endarterectomy

		<u>Pre Treatment</u>	<u>Post Treatment</u>
C.	APRAXIA BATTERY		
1.	Oral Subtest		
	a. Correct Responses	100	
	b. Distorted Correct Responses	0	
	c. Intelligible Cued Responses	0	
	d. Distorted Cued Responses	0	
	e. No Responses	0	
2.	Verbal Subtest		
	a. Correct Responses	20	
	b. Distorted Correct Responses	30	
	c. Intelligible Cued Responses	10	
	d. Distorted Cued Responses	40	
	e. No Responses	0	
D.	SPONTANEOUS SPEECH	<u>Pre Treatment</u>	<u>Post Treatment</u>
1.	Clinic Sample		
	a. MLU	2.6 words	13.8 words
	b. Communicative Success	68%	100%
2.	Environmental Sample		
	a. MLU	3.4 words	12.9 words
	b. Communicative Success	40%	100%

Patient 2. This patient presented with good receptive abilities, severe oral and verbal apraxia and poor imitative ability, as shown in Table 2. Although he was able to monitor his errors, he was unable successfully to self-correct his behavior. As a result he avoided any communicative interactions if at all possible. Baseline MLU was 1.8 in the clinic and 1.5 at home, with communicative success 20 percent on clinic sample and 0 percent at home.

Table 2. Data summary for Patient 2.

Age: 82	Premorbid Vocation: Stock Broker	
Sex: M	Education: College	
Mo. post onset 5 months	Previous Therapy: Yes	
	<u>Pre Treatment</u>	<u>Post Treatment</u>
A.	PICA	
	1. Gestural	8.4
	2. Verbal	10.4
B.	APRAXIA BATTERY	
1.	Oral Subtest	
	a. Correct Responses	40
	b. Distorted Correct Responses	30
	c. Intelligible Cued Responses	20
	d. Distorted Cued Responses	0
	e. No Responses	10
2.	Verbal Subtest	
	a. Correct Responses	0
	b. Distorted Correct Responses	0
	c. Intelligible Cued Responses	0
	d. Distorted Cued Responses	100%
	e. No Responses	0
C.	RACE	
	1. Oral Comprehension	63%
	2. Auditory Comprehension	77%
	3. Reading	50%
	4. Writing	47%

	<u>Pre Treatment</u>	<u>Post Treatment</u>
D. SPONTANEOUS SPEECH		
1. Clinic Sample		
a. MLU	1.8 words	9.6 words
b. Communicative Success	20%	100%
2. Environmental Sample		
a. MLU	1.5 words	7.8 words
b. Communicative Success	0%	100%

Patient 3. This patient presented with severe apraxia of speech and poor imitative ability, as shown in Table 3. Receptive language, reading, and writing were also impaired. He had begun to circumlocute and engage in excessive and redundant verbalizations to increase his chances of communicative success. However, his self monitoring skills were poor and most of his communicative output was unsuccessful. Baseline measurements indicated an MLU of 5.68 in the clinic and 6.5 at home with communicative success of 20 percent in the clinic and 52 percent at home.

Table 3. Data summary for Patient 3.

Age: 54	Premorbid Vocation: Welfare Department Supervisor	
Sex: M	Education: B.A.	
Mo. post onset: 5 months	Previous Therapy: Yes	
	<u>Pre Treatment</u>	<u>3-Week Post Treatment Probe</u>
A. PICA		
1. Gestural	13.9	14.29
2. Verbal	8.23	8.03
B. APRAXIA BATTERY		
1. Oral Subtest		
a. Correct Responses	40%	40%
b. Distorted Correct Responses	20%	40%
c. Intelligible Cued Responses	40%	20%
d. Distorted Cued Responses	0	0
e. No Responses	0	0
2. Verbal Subtest		
a. Correct Responses	13%	13%
b. Distorted Correct Responses	0	0
c. Intelligible Cued Responses	0	7%
d. Distorted Cued Responses	0	0
e. Unintelligible Responses	87%	80%
C. RACE		
1. Oral Expression	58%	75%
2. Auditory Comprehension	73%	75%
3. Reading	65%	70%
4. Writing	27%	35%
5. Gesture	100%	100%
D. SPONTANEOUS SPEECH		
1. Clinic Sample		
a. MLU	5.68	13.08
b. Efficient	1/25	13/25
c. Communicative Success	1/25	5/25
d. Unsuccessful	20/25	0
e. Rejection	4/25	0

	<u>Pre Treatment</u>	<u>3-Week Post Treatment Probe</u>
D. SPONTANEOUS SPEECH, continued		
2. Environmental Sample		
a. MLU	6.5	15.08
b. Efficient	8/25	12/25
c. Communicative Success	12/25	24/25
d. Unsuccessful	13/25	0
e. Rejection	0	0

#### THE TREATMENT PROGRAMS

Baseline Assessment. General cognitive, language, and motor speech assessments were evaluated to determine each patient's behavioral strengths and weaknesses. For all patients, the primary difficulty was apraxia of speech and limited communicative success. Responses were characterized by highly inconsistent sound substitutions with multiple unsuccessful off-target attempts to self-correct. An environmental assessment indicated that patients 1 and 2 had withdrawn from communicative interactions despite relatively good language ability. Patient 3 performed better at home than in the clinic, but a severe impairment was present. Because of the great error inconsistency, and in an effort to make a rapid and profound impact on the patient's communication, it was decided not to develop a treatment program for effecting change in motor speech performance. Instead a program was designed to manipulate the environmental antecedent and consequent events adjacent to the patient's communicative attempts. The purposes of treatment for all patients were to: 1) improve communicative success, 2) maximally improve socio-vocational systems, 3) increase personal autonomy and 4) improve communicative form, in that order.

The Intervention Strategy. In general, the treatment plans were:

1. Determine patient/SOP\* treatment goals.
2. Train Patient and SOP to modify communicative ability.
3. Evaluate change at home and in clinic.
4. Measure generalization to outside environments.
5. Assess impact on Patient's/SOP life system.
6. Determine future treatment goals.

\*SOP=significant other person

Patients 1 and 2. For Patients 1 and 2, the overall goal of treatment was to return them to an active social life and personal self management. As both patients were happily retired, neither wished to pursue new vocational aspirations. Baseline assessments indicated that the patients were producing limited expressive output and generally were failing at attempts to communicate. Thus, the SOP was trained to engage in clinical interviewing tactics including:

1. Open-ended questions.
2. Verbal Following.
3. Paraphrasing content or feeling.
4. Reflecting content or feeling.
5. Minimal encouragers.
6. Attending behavior.

These tactics are used by psychologists to help a patient verbalize his/her feelings and ideas. It was hoped that by training the SOP to apply these tactics contingent upon the patient's communicative attempts, it would facilitate the patient's success.

Pre and Post Tests. Measures of communicative success and mean length of utterance were assessed from clinical and environmental spontaneous speech samples to evaluate the patient's behavior change. SOPs were trained to collect and evaluate these samples from baseline video tapes made in the home environment. These samples were used as daily home assessments as well as to evaluate overall changes. Patient and family interviews were taken to determine environmental impact of the service.

## RESULTS

### Patient 1

Behavior Change. Spontaneous speech samples indicated that after eight one-hour therapy sessions and daily environmental manipulation, the patient's MLU increased from 2.6 to 13.8 in the clinic and from 3.4 to 12.9 at home. Communicative success increased from 68 to 100 in the clinic and from 40 to 100 percent at home.

Environmental Impact. For the first six months post onset, language exercises from The Speech and Language Rehabilitation Workbook (Keith, 1972) were dropped off (without instruction) at home by a local clinician. Because the patient presented with no language difficulties, she was able to complete all reading, writing and cognitive tasks easily but she feared that because the therapist was giving her such assignments these abilities would soon deteriorate. Thus, she sold her home and furniture, gave power of attorney to a friend, made plans to move to a nursing home and withdrew from all social and intellectual activities. Fearing cognitive incapacitation, she, in her words, "prepared for and was awaiting death." After moving in with a friend until she could be placed in a nursing home, she came to our clinic 25 miles away from her hometown as a last effort toward changing her speech. Her friend served as the SOP and utilized the interviewing tactics to encourage her communicative output. As treatment progressed the patient began to experience dramatically increased success when attempting to communicate. Although she continued to make apraxic errors, her intelligibility increased as MLU increased, offering the listener more information for decoding the message. As she improved, the SOP began to return to her own natural communicative style, and the patient easily generalized her improved communicative ability to others. In therapy she was encouraged to return to her ordinary daily activities as quickly as she felt she could comfortably manage them. At present, she has rented an apartment, has purchased new furniture and is decorating her new home. She has regained control over her finances, is interacting in church and social activities and entertaining friends. Basically she is managing her life as independently as she did prior to her stroke.

### Patient 2

Behavior Change. Spontaneous speech samples indicated that after five one-hour therapy sessions and daily environmental manipulation, the patient progressed from speaking in basically one-word utterances, if at all, to an MLU of 9.6 in the clinic and 7.8 at home. Communicative success changed from 20 percent in the clinic and 0 percent at home to 100 percent. All treatment took place over a two-week period.

Environmental Impact. This patient had generally withdrawn from all communicative interactions. He refused to leave his home and would not respond to communicative attempts from his wife. He was extremely frustrated by his lack of volitional speech and elected to completely isolate himself from people and activity. The SOP brought the patient to our clinic from out

of town for a two-week intensive intervention program. As therapy progressed the patient began to circumlocute to provide the SOP with additional information for decoding the message. At present, he has been dismissed from treatment for over six months. He has returned to social activities at his country club, joins former business associates for lunch, and interacts with his wife appropriately.

### Patient 3

Treatment Goals. For Patient 3 the overall goals of treatment were to improve communicative ability so that he could manage personal affairs and interactions independently and ultimately return to work. Baseline assessments indicated that the patient was using 5-6 word sentences on the average, his communicative success was better at home (52%) than in the clinic (20%), and that reading and writing were severely impaired. A closer look at the patient's spontaneous speech samples indicated that his output was highly inefficient. He was avoiding difficult words, much like a stutterer, yielding redundant and often unsuccessful communicative attempts. Following the evaluation, his general treatment plan was divided into three parts: 1) a speech pathology program designed to improve communicative success and efficiency, 2) a reading and writing program, and, 3) a work evaluation and placement under the direction of the Bureau of Vocational Rehabilitation.

The Intervention Strategy. For Patient 3 a plan to increase verbal output would not have been appropriate, because the patient was already engaging in excessive and redundant language as a reaction to his apraxia. Thus a three phase program was developed.

#### Phase I: Training in Volitional Control and Self Evaluation

The patient and SOP created a corpus of 10 stimulus questions and 10 responses that they felt would occur routinely in one of their home conversations. The SOP asked the questions and the patient attempted to produce the answer from a graphic cue. The patient then evaluated his own behavior on a Base 10 Form. Three training units of 10 responses each were developed by the SOP and patient. In Figure 1 the patient's progress for Training Units I, II, and III is presented. All training was conducted at home. Clinic appointments were used for reliability checks and revision of tactics.

#### Phase II: Training in Self Regulation and Pseudo Conversation

The Self Regulatory Model suggests a four-part paradigm including self-instruction, self monitoring, self evaluation, and self consequence. During Phase II, responsibility for each of these activities was transferred from SOP to patient. The SOP engaged the patient in a conversation about the topics used in Phase I, but the patient was encouraged to generate novel and appropriate responses. The patient was advised to self-cue by writing words causing him difficulty, to monitor his output, and to evaluate his own performance on a Base 10 Form. The consequence of his behavior was basically the listener's comprehension of his response. The SOP was trained to paraphrase the patient's output to indicate that she understood and to help eliminate his redundancy. As the patient improved, he discontinued the use of self cues naturally and the SOP returned to a more normal peer interactive mode. The patient's progress for Training Units I, II, and III is presented in Figure 2.

**Patient 3: Training in Volitional Control and Self Evaluation**

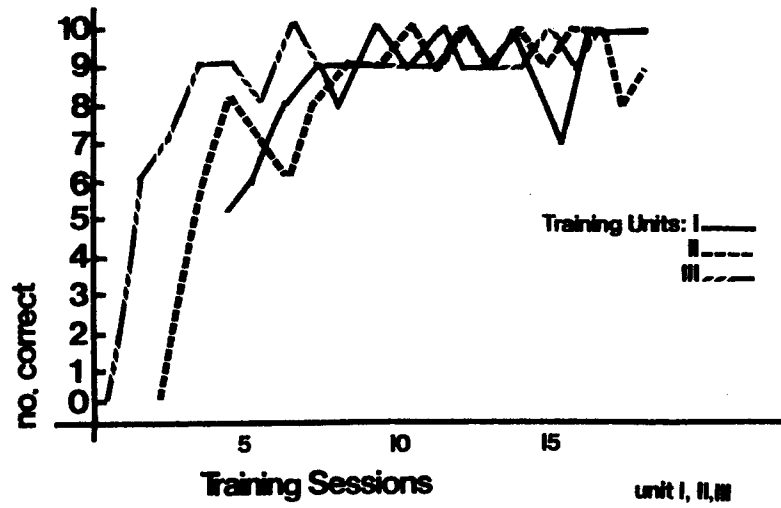


Figure 1. Results of training in self-regulation for Patient 3.

**Patient 3: Training in Self Regulation**

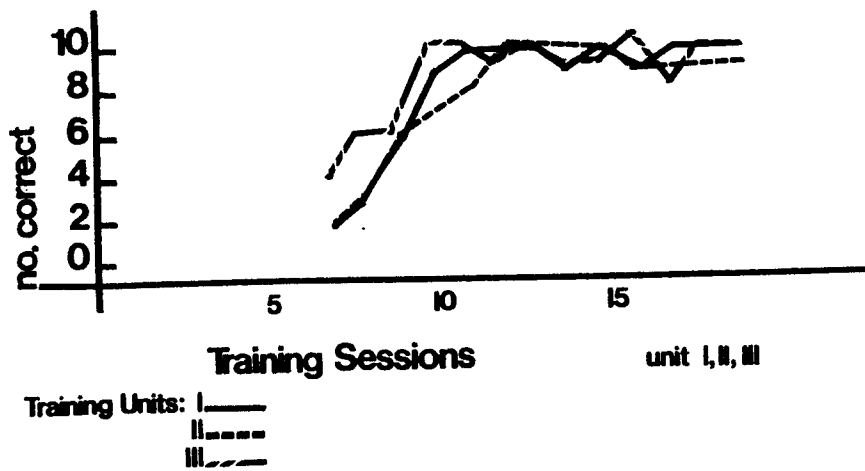


Figure 2. Results of training in volitional self-control and self-evaluation for Patient 3.

### Phase III: Self Monitoring of Spontaneous Speech

The SOP and patient completed a spontaneous speech sample each day. The SOP transcribed 25 utterances on a Spontaneous Speech Form and evaluated communicative success and MLU from a tape recording. Gradually each of these abilities was transferred from the SOP to the patient. The patient's MLU changed from 5.68 in the clinic and 6.5 at home to 13.08 and 15.08 respectively, as shown in Figure 3. His communicative success increased from 1/25 in the clinic and 5/25 at home to 25/25 and 24/25 respectively, as shown in Figure 4.

Environmental Impact. This patient and SOP lived on a farm about an hour's drive from Columbus and commuted to work. Following his stroke, the family was encouraged by the local speech pathologist to sell their farm and move to the city near neighbors and friends who could care for the patient. The therapist informed them that prognosis was poor and that they would see a deterioration of his abilities over time. The patient was given consonant/vowel drills to improve his apraxia but little improvement was noted by the patient, family or therapist.

Presently the patient rides his bike to visit friends and shop for groceries. According to the patient and his wife, his communicative ability has improved in all home and social environments, yielding much greater personal autonomy. Therapy is now designed to improve his communicative form and efficiency so that he can become more employable. He is currently undergoing work evaluation and placement through the Bureau of Vocational Rehabilitation.

### SUMMARY

Rather than attempting to correct motor speech errors, the environments of patients 1 and 2 were manipulated to facilitate communicative success. Patient 3 was taught to self-regulate communicative behavior within environmental contexts. Because environmental agents participated in the design and implementation of therapy, they soon began to recognize their own facilitative and nonfacilitative behaviors. The newly learned strategies began to compete with and ultimately replace punitive, aversive or unsuccessful behaviors that they were previously using. As a result the patient and SOPs reported marked improvement in their overall relationships as well as communicative interactions. For each of the patients, improved communicative ability lead to more independent self management of total life systems.



**Patient 3: Mean length of utterance Changes on Spontaneous Speech Sample**

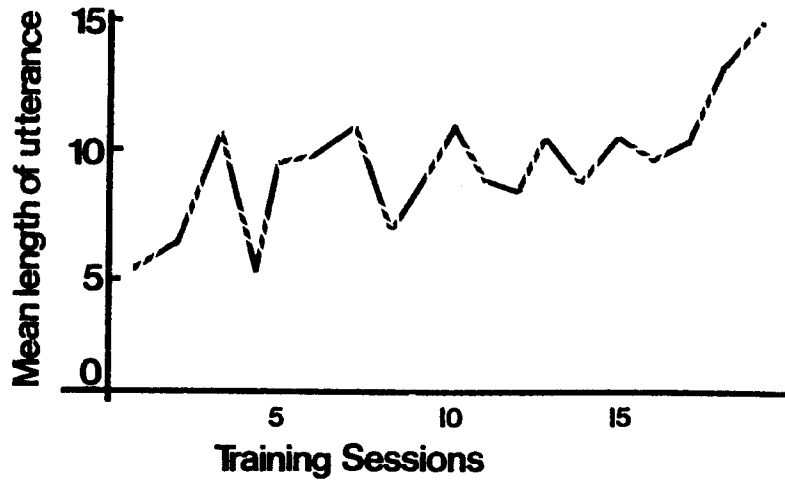


Figure 3. Mean length of utterance for Patient 3 over training sessions.

**Patient 3: Communicative Success on Spontaneous Speech Sample**

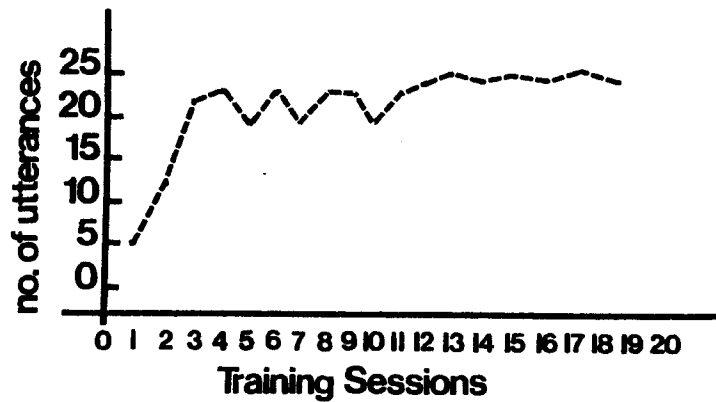


Figure 4. Communicative success for Patient 3 over training sessions.