# A Treatment Protocol For Nonverbal Stroke Patients

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Following a cerebrovascular accident (CVA), patients with communication impairments may present with expressive/receptive language difficulty, motor programming deficit, or paralysis or paresis of the speech musculature -- either singly on in concert. Because of the variety of communicative impairments subsequent to a CVA, unselected patient groups are usually too heterogeneous for meaningful investigations. We are limiting our discussion to those patients meeting the following criteria:

1. patients are essentially nonverbal except for recurrent utterances or verbal stereotypes.
2. auditory comprehension is intact to the degree that instructional information may be processed with adequate performance as a result.
3. patients may present with severe apraxia of speech and oral/nonverbal apraxia, but without a significant dysarthric component.

In the past, one set of treatment procedures designed for this type of patient has been directed primarily at a phonemic level. In part because of evidence of oral apraxia and apraxia of speech, it was believed that the motor programming function should be retrained and that therapy should begin with tongue placement and other motoric movements preparatory to phonemic production (Corbin, 1951). Gradually, phonemes would be combined into syllables, syllables combined into words, and words combined into phrases or short sentences. Although Corbin published her description of therapy more than 25 years ago (an approach by no means novel in 1951), similar strategies are still being reported today (Darley, Aronson and Brown, 1975; Dabul and Bollier, 1976; and Rosenbek, 1976).

In terms of treatment results, Corbin reported that three of her four patients did not regain functional communication. Dabul and Bollier noted that their two patients demonstrated improved performance on specific tasks, but neither they, Darley, Aronson and Brown, nor Rosenbek provide data regarding generalization to functional communication.

One further consideration must be made concerning the efficacy of this type of therapeutic approach. Both Corbin and Dabul and Bollier followed their patients approximately three times per week for a year. The question of cost/benefit ratio would seem applicable to this approach, especially when it is applied to stable, severely impaired patients. We must begin to look more closely at the real results of strategies emphasizing articulatory parameters in our severely involved patients.

Because of the significant reduction in verbal output this type of patient demonstrates, strategies have been designed which focus on a different aspect of the problem. Rosenbek, et al., (1973) reported a program which, although applicable to the phoneme or syllable level, focused on the production of sentences as the immediate goal. Nevertheless, progress toward attaining the goal of volitional sentence production was slow; the ability to produce the sentence without cues from the therapist and permanence of training were reported to be poor. Similarly, although differing in rationale, Melodic Intonation Therapy was designed for the type of patient we are discussing (Albert, Sparks, and Helm, 1973; Sparks, Helm and Albert, 1974; and Sparks and Holland, 1976).

Following the publication of the Rosenbek, et al., paper; a perusal of related literature (Alajouanine, 1956; Alajouanine and Lhermitte, 1964; and Beyn and Shokhor-Trotskaya, 1966); and some of our own work (Deal and Florence, 1974; and Florance and Deal, 1975) we began to experiment with modifying the Rosenbek program. The eight-step task continuum was reduced to four steps, criterion levels were made considerably more stringent, and an initial emphasis on training target communication units was established (Deal and Florance, 1977). After five years of preliminary experimentation, the Treatment Protocol for the Non-Verbal Stroke Patient, as presented in Figure 1 emerged. In this protocol, the training of target sentences is only a means toward the end goal of retraining the programming process; thus enabling the patient to volitionally produce novel utterances and ultimately generate environmental communication adequate for social and vocational interaction.

## Protocol

The training procedure consists of the following levels:

STEP 1 Training Target Sentences

Part A: Auditory, visual and graphic stimuli -- production of target sentence (TS) with simultaneous auditory and visual cues.

Part B: Auditory stimulus -- production of sentence with visual cues only.

Part C: Auditory stimulus -- production of TS without cues.

Part D: Graphic stimulus -- independent production of TS.

STEP II Pseudoconversational Procedure

Part A: Stimulus: pre-established question
Response: trained target sentence.

Part B: Stimulus: pre-established question
Response: any appropriate response.

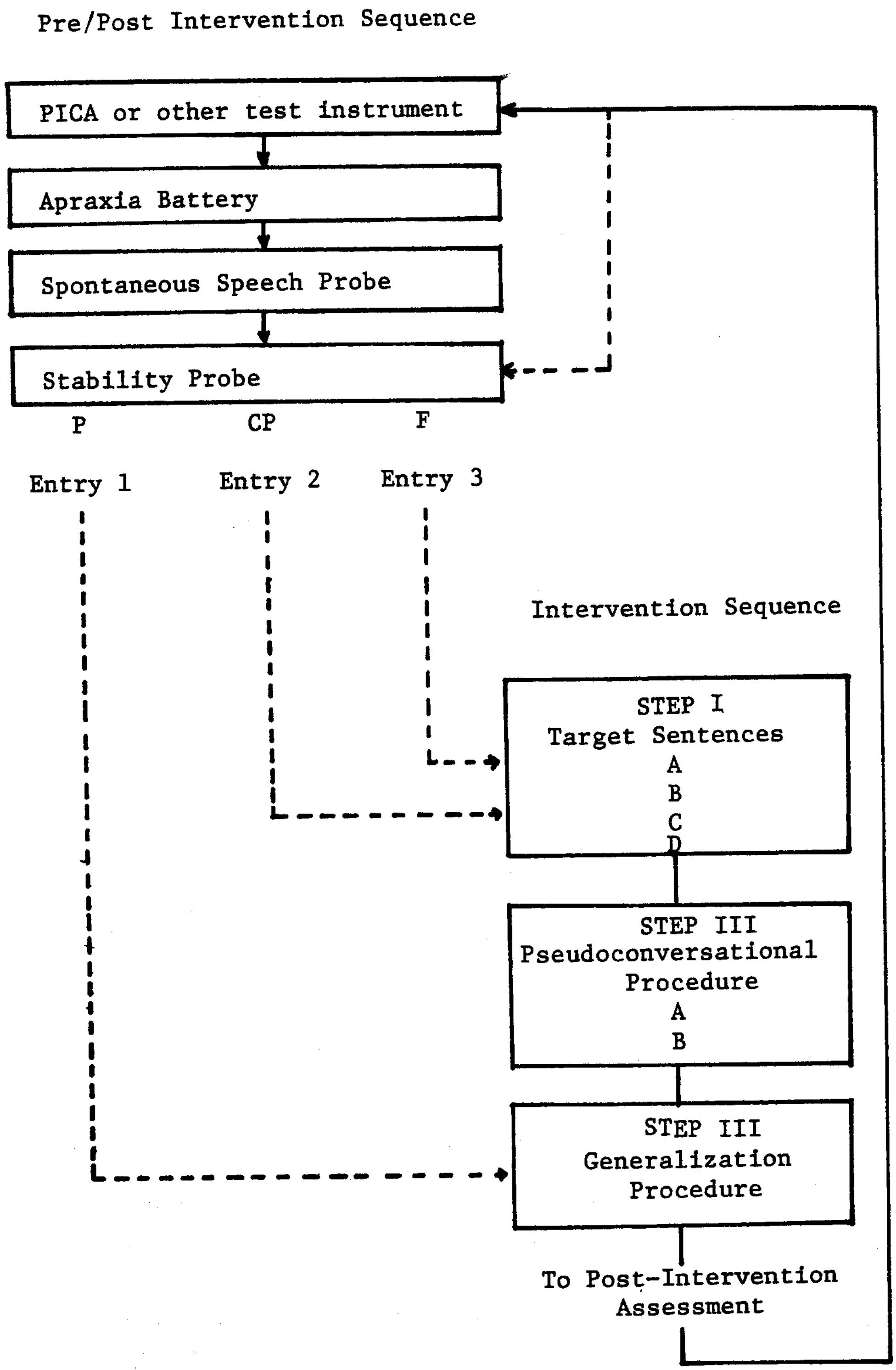


Figure 1. Model of Nonverbal Treatment Protocol

STEP III <u>Generalization</u>

Conversational sample utilizing training content topic, training and related responses. Stimulation of novel utterances. MLU and CS are measured.

The criterion level for advancement is an accumulative 80% correct production. Prior to the initiation of treatment, a session with the patient and spouse (or family member, or friend, or anyone else who may know the patient) is held to determine the appropriate training content. Target sentences are developed to meet the immediate needs and communicative desires of the patient. The target sentences (10) are constructed so that each is logically related to the other and so that they form logical responses to a series of coordinated questions. A baseline Spontaneous Speech Probe is taken to determine the mean length of utterance (MLU) based on a 25 utterance sample. In addition, the degree of communicative success (CS) is determined so that data concerning the percentage of utterances which successfully conveyed meaning to the listener may be tracked. Following the Spontaneous Speech Probe, the ten pre-constructed sentences are presented to the patient. If the patient produced 80% of the material correctly (P) he enters the protocol at Step IIA. If he is 80% correct with cueing (CP) he enters at Step IC. If he is less than 80% correct, even with cues (F), he enters at Step IA. Cueing is permitted in the Spontaneous Speech Probe and in Step III.

A number of our patients produced no pre-treatment spontaneous speech, yielding an MLU of 0.0 (recurrent utterances are not considered in the MLU). Our treatment procedure begins at a three-word sentence level. We do not train phonemes, syllables, or one word responses.

During the five-year period over which this protocol has evolved, a great deal of revision and expansion has occurred. Clinician/patient interaction had led us into continuous redevelopment of the protocol's structure and content. We have, however, completed the protocol in its present form with 15 patients. Table 1 summarizes the data for those 15 patients.

## Patients

The patients were selected from a Veterans Administration Hospital, a community hospital in an urban area, and from patients enrolled in a program sponsored by the Ohio Department of Health. Patients ranged in age from 34 to 69 years and in duration of aphasia from 2 to 61 months. The patients were followed for intervals ranging from two months to nine months. Ten of the fifteen patients had been aphasic for at least six months prior to initiation of the protocol. Criteria for placement were stated earlier.

## Results

The remainder of Table 1 provides pre- and post-treatment PICA scores and pre- and post-treatment MLU scores. Table 2 contains the differences between the means of PICA scores, MLU, and communicative success before and after the protocol. As given in Table 2, the post-treatment scores were significantly higher for each variable tested. The range of pre-post changes in the PICA

Table 1. Patient Summary Data

| Subj. No. | Age | Sex | Etiol. | Mos. Post Onset | No. of Trts | OA | Gest | Verb | Graph | MLU |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 62 | F | Aneur. | 48 | 46 | *8.94 | 11.00 | 7.80 | 7.00 | 0.00 |
| | | | | | | 9.72 | 12.00 | 8.70 | 8.70 | 4.04 |
| 2 | 55 | F | CVA | 14 | 100 | 9.06 | 11.85 | 5.75 | 7.53 | 1.48 |
| | | | | | | 9.20 | 11.90 | 5.70 | 7.75 | 2.96 |
| 3 | 61 | M | CVA | 61 | 51 | 11.30 | 14.10 | 7.70 | 9.85 | 0.00 |
| | | | | | | 12.14 | 13.15 | 11.87 | 10.98 | 7.72 |
| 4 | 34 | M | CVA | 12 | 63 | 9.56 | 11.20 | 10.75 | 6.55 | 3.28 |
| | | | | | | 10.36 | 11.06 | 11.48 | 8.10 | 10.08 |
| 5 | 69 | F | CVA | 2 | 10 | 11.24 | 13.60 | 12.10 | 4.95 | 2.90 |
| | | | | | | 11.88 | 13.50 | 13.50 | 5.70 | 7.70 |
| 6 | 55 | M | CVA | 3 | 12 | 9.45 | 12.20 | 6.30 | 6.30 | 1.20 |
| | | | | | | 11.03 | 13.20 | 7.90 | 7.90 | 3.50 |
| 7 | 54 | F | CVA | 3 | 48 | 8.21 | 11.80 | 3.10 | 5.80 | 0.00 |
| | | | | | | 10.64 | 11.85 | 13.00 | 5.00 | 7.60 |
| 8 | 66 | M | CVA | 7 | 63 | 8.98 | 12.63 | 5.47 | 5.40 | 0.00 |
| | | | | | | 9.74 | 12.88 | 7.50 | 7.05 | 4.07 |
| 9 | 56 | M | CVA | 3 | 42 | 4.13 | 5.44 | 2.00 | 3.13 | 0.00 |
| | | | | | | 11.91 | 13.40 | 12.45 | 9.23 | 6.30 |
| 10 | 57 | M | CVA | 3 | 27 | 9.17 | 11.17 | 9.92 | 6.00 | 0.00 |
| | | | | | | 12.75 | 13.10 | 13.70 | 12.13 | 6.88 |
| 11 | 62 | M | CVA | 12 | 20 | 9.43 | 12.43 | 6.70 | 7.26 | 3.10 |
| | | | | | | 12.21 | 14.73 | 8.10 | 9.70 | 7.17 |
| 12 | 55 | M | CVA | 6 | 5 | 11.22 | 14.31 | 11.47 | 6.95 | 5.12 |
| | | | | | | 13.28 | 14.40 | 12.73 | 12.17 | 8.12 |
| 13 | 59 | M | CVA | 12 | 24 | 10.87 | 12.67 | 7.15 | 10.96 | 2.28 |
| | | | | | | 11.76 | 13.24 | 9.45 | 11.33 | 3.68 |
| 14 | 46 | M | Hemor. | 25 | 41 | 9.04 | 12.51 | 5.10 | 7.03 | 0.00 |
| | | | | | | 9.30 | 12.56 | 5.43 | 7.53 | 2.12 |
| 15 | 52 | M | CVA | 16 | 32 | 10.78 | 12.65 | 8.87 | 9.73 | 3.00 |
| | | | | | | 12.69 | 13.91 | 12.33 | 11.32 | 6.80 |

*First row of PICA scores = pretreatment, second row = post treatment. Median months of treatment = 7 months, range = 2 - 9 months.

overall scores is quite large, from 0.14 to 7.78. The range of changes in PICA verbal scores is even larger from -0.10 to 10.45. Obviously the changes are not consistent across patients.

Because the primary goal of the protocol is to establish volitional control of spontaneous speech, the changes in MLU and CS deserve a closer examination. Of the 15 patients, ten increased MLU by at least four words. The remaining five patients demonstrated an MLU increase of less than four words. With respect to communicative success, eight patients increased success rate more than 50% and four of those eight increased CS by 88% or better. Increased functional communication, as determined by MLU and CS, was noted for all 15 patients and a majority demonstrated substantial successful generalization to conversational interaction.

We were also interested in the possibility of being able to determine whether change in one variable would predict change in another variable. As shown in Table 3, there were no significant correlations between variables selected. The correlation between communicative success and MLU did approach significance. As more data are collected, this relationship may reach significance.

## Discussion

First, utterance length increased significantly. We believe this is a reflection of the design of the protocol. The fact that the target sentences are related to each other and follow a logical question/answer sequence is, in our opinion, crucial to generalization and the generation of novel utterances. We believe this statement is supported by the increase in communicative success. Not only are the patients' utterances longer, but they also provide meaningful information to the listener. Increasing the number of words per utterance without a concommitant increase in communicative success would accomplish little.

We were surprised to find no correlation between either MLU or communicative success and PICA scores. We had expected that the change in MLU and the change in communicative success would be correlated with the change in PICA verbal tasks and conversation. Providing a patient with a syllable cue during conversation might allow the patient to produce significant utterance -- a cue the PICA does not provide.

It is also interesting to note that the number of visits, duration of aphasia, and the age of the patient did not correlate with the MLU attained at the end of the protocol. A large portion of the literature of aphasia would lead us to expect a negative correlation between the time post-onset and the attained MLU. The lack of significant correlation between MLU and number of visits, together with the wide range of change scores, indicates that we still have a long way to go before we are able to specify patient parameters and the influence of those parameters on communication.

Although we noted significant increases in all parameters under study, the amounts of change per variable do not appear to be closely related -- leaving us to generate additional data, experimental questions, and more precise analyses.

In summary, we believe we have developed a treatment protocol which is effective in establishing volitional communicative ability for nonverbal stroke patients. Prognostic factors and the relationships among communicative, therapeutic, and patient parameters remain an enigma.

Table 2. Mean Differences Between Post-Treatment And Pre-Treatment Means.

| Variable | | | | |
|---|---|---|---|---|
| PICA Overall | 15 | 1.815 | 1.92 | 0.001 |
| PICA Gestural | 15 | 1.035 | 2.09 | 0.037 |
| PICA Verbal | 15 | 2.244 | 2.62 | 0.002 |
| PICA Graphic | 15 | 1.780 | 2.22 | 0.007 |
| Mean Length Utterance | 15 | 4.48 | 2.18 | 0.0001 |
| Communicative Success | 13 | 0.609 | 0.37 | 0.00005 |

Table 3. Correlation Coefficients Between Selected Variables.

| Dependent Variable | Independent Variable | r | Obs. Level Significance |
|---|---|---|---|
| PICA Overall | MLU | .395 | .1445 |
| PICA Gestural | MLU | .157 | .1202 |
| PICA Verbal | MLU | .350 | .2010 |
| PICA Graphic | MLU | .240 | .3887 |
| Communicative Success | MLU | .504 | .0788 |
| MLU | # visits | .075 | .7897 |
| MLU | Time Post | .189 | .5012 |
| MLU | Age | .196 | .4849 |

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## Questions & Answers

Q. How did you relate the number of sessions?
A. We don't really have an interpretation of that. We think there are differences among patients that we are not aware of yet. These patients are not exactly alike and we do not have enough data to be able to specify the relationship.

Q. What kind of statistics were you using?
A. Regression and *t* tests for correlated data.

Q. Weren't you looking at a lot of variables for the number of subjects you were using?
A. Yes. As our N increases we will feel more confident using regression analysis and in the future plan multiple regressions.

Q. On the ITPA, the verbal expression subtest, they claim it is a verbal subtest. I think there are a number of other tests that essentially try to elicit single word responses and people will say these are indices of verbal expression. Do you really believe that is true?
A. In my opinion?...No.

Q. Have you established an entrance criterion for auditory comprehension?
A. Not really. Initially we did specify certain scores on PICA VI and X, but we have since dropped that. Patients do have to be able to monitor themselves. This is one parameter we hope to specify in the future.