CHAPTER

28

Visual Action Therapy for Bucco-Facial Apraxia

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Sarno and Levita (1981) reported that the majority of patients referred for early aphasia rehabilitation have global aphasia. Global aphasia is defined as severely impaired performance on all tests requiring the production and comprehension of speech and writing (Albert, Goodglass, Helm, Rubens, and Alexander, 1981). In addition severe limb and bucco-facial apraxia often are part of the symptom complex (Kertesz and Hooper, 1982).

Because attempts to rehabilitate globally aphasic patients utilizing traditional language therapies were largely futile (Marks, Taylor, and Rusk, 1957; Godfrey and Douglass, 1959; Schuell, Jenkins, and Jimenez-Pabon, 1964), this syndrome came to be regarded as a competency disorder, that is, the loss of intuitive knowledge of language. This notion led to two studies designed to explore the extent to which global patients retain the conceptual functions and capacity for symbolization (Glass, Gazzaniga, and Premack, 1973) and the computational mechanisms involved in language (Gardner, Zurif, Berry, and Baker, 1976). Both studies used non-orthographic, visual symbol systems. Based on their findings, these investigators concluded that global patients retain a rich conceptual system despite massive deficits. They also retain at least some of the cognitive operations necessary for natural language.

While expanding our understanding of the nature of global aphasia, these investigations focused primarily on theoretical issues rather than exploring the rehabilitation effects of their methods. These findings, however, encouraged us to develp a treatment program called Visual Action Therapy (VAT), first described in 1982 (Helm-Estabrooks, Fitzpatrick and Barresi, 1982). Briefly, this nonvocal method uses real and pictured objects, as well as gestural stimuli, to train patients to produce hand gestures for hidden items. VAT was shown to result in highly significant improvement of pantomine and auditory comprehension on the Porch Index of Communicative Ability (PICA) (Porch, 1971). This improvement was independent of time post-onset of aphasia. Verbal performance, however, did not change significantly. The improvements found in pantomime scores were accounted for by a reduction of limb apraxia. Improvements found in auditory comprehension following this nonverbal treatment were more difficult to explain, but the following hypotheses were forwarded: (1) It was suggested that internal verbal monitoring may have been employed during the training tasks, (2) it was suggested that some of the conceptual systems necessary for linguistic performance may have been reintegrated with VAT, and (3) it was proposed that VAT may have improved the attention, visual, spatial, and visual search skills used in test taking. Hypotheses one and two, however, might predict improvement in verbal performance as well as comprehension. But this did *not* occur. We hypothesized further, therefore, that persistently severe bucco-facial aprax-

ia, which was not directly treated by the VAT program, may have interfered with or inhibited changes in verbal expression.

In 1970 Luria suggested that training of basic-level oral movements such as blowing may be the essential first step in the eventual restoration of articulatory movements in severe disturbance of verbal expression. In keeping with Luria's suggestion and our 1982 findings, a VAT program was developed for training bucco-facial praxis skills. This chapter reports the effects of this treatment program on the language test performance of severely aphasic patients and compares these effects with those of the limb VAT program.

METHOD

SUBJECTS

Six aphasic stroke patients aged 34 to 63 years participated in this study. All presented with severe communication deficits characterized by reduced verbal output and poor auditory comprehension, with concomitant bucco-facial apraxia. The Boston Diagnostic Aphasia Examination (BDAE) (Goodglass, and Kaplan), 1972, 1983) aphasia severity rating ranged from 0.5 to 1.0, and PICA overall scores from 8.11 to 10.56. Boston Praxis Test results showed that all subjects had moderate to severe bucco-facial apraxia. The time post-onset at the initiation of bucco-facial VAT ranged from 2 to 103 months ($\bar{X}$ = 20.8). All subjects except subject 2 had received a course of another treatment prior to participation in this study. Despite previous therapeutic efforts they continued to have little to no verbal output (Table 28-1).

TREATMENT

Bucco-Facial Visual Action Therapy (B/F VAT) is a nonverbal, hierarchically structured treatment program for the remediation of bucco-facial apraxia. The method employs eight real objects (i.e., razor, lipstick, lollipop, straw, flower, cup, kaleidoscope, and whistle), corresponding pictures of the objects, and action pictures that depict the objects being used by a person. All objects could be represented by gestures involving the mouth and face, but none of the objects are included on the PICA which served as the dependent variable.

The treatment program consisted of three treatment levels and multiple steps in which patients were trained to represent gesturally hidden pictures of the training object. A three-point scoring system was used, where

TABLE 28-1. SUBJECT CHARACTERISTICS

Subject	*Age (years)*	*MPO*	*Previous treatment*
1	59	2	Limb VAT
2	63	2	No previous treatment
3	38	17	Limb VAT and an auditory comprehension program
4	51	16	Extensive treatment at two other facilities focusing on auditory comprehension and other traditional treatments, as well as limb VAT
5	34	5	Limb VAT
6	53	103	Extensive traditional treatment, both individual and group

MPO = months post-onset.

1 point indicated a fully correct response, 0.5 indicated a self-corrected or partially correct responses, and 0 indicated failure. A score of 7.5 points was required for progress up the step and level hierarchy. A description of the step-by-step methodology is provided in the Appendix.

DEPENDENT MEASURES

The PICA was selected as the dependent measure of treatment effect because it contains both verbal and gestural tasks and a multidimensional scoring system that is sensitive to subtle changes that may occur with treatment.

RESULTS

Subjects completed the B/F VAT program in 4 to 30 sessions ($\bar{X}$ = 9.8) at a rate of two to four sessions per week. Pearson product-moment correlations indicated no statistically significant relationship between the time post-onset or age and the number of sessons required to complete the treatment program ($r = .34$, $p > .05$).

A paired-comparison t-test was used to measure changes in PICA overall, verbal, and gestural scores, as well as those earned on individual subtests. Statistically significant positive treatment effects were found for

Overall score $p = .0129$

Combined gestural score $p = .0197$

Subtest III (pantomime with objects) $p = .0063$

Subtest V (reading prepositions and nouns) $p = .0189$

Subtest VI (comprehending spoken verbs) $p = .0066$

Subject XII (repeating nouns) $p = .014$

Pearson product-moment correlations showed no statistically significant relationship between age or time post-onset and improvement on these six PICA measures (Table 28-2).

Finally, because statistically significant improvement in verbal repetition skills occurred with B/F VAT but not with the 1982 program that trained mostly limb praxis, it seemed important to compare the two groups of patients. Five patients from the present study were matched on the basis of pretreatment PICA repetition score (subtest XII) with five patients from the 1982 study. t-Test for independent measures showed no statistically significant difference between the two sets of pretreatment repetition scores ($t = .04$, $p > .05$). Having established the similarity of pretreatment repetition skill, repetition performance was compared for pre- and post-limb VAT and pre- and post-B/F VAT. Statistically significant improvement in repetition skills did occur after a course of B/F VAT ($p < .01$), but not following limb VAT ($p > .05$).

CONCLUSIONS AND CLINICAL IMPLICATIONS

In 1982, Helm-Estabrooks and colleagues reported on the success of a nonverbal, gestural treatment approach for global aphasia and limb apraxia. Although the patients in the 1982 study showed statistically significant improvements in auditory comprehension and pantomime, no changes were noted in any test of verbal expression. It was hypothesized, therefore, that bucco-facial apraxia, which was not directly treated by limb VAT may have interfered with or inhibited changes in verbal performance.

The patients in the present study were treated with a new form of VAT that was specifically designed to treat apraxia of the bucco-facial muscula-

TABLE 28-2. PEARSON PRODUCT-MOMENT CORRELATIONS (RHO) BETWEEN TIME POST-ONSET, AGE, AND PICA IMPROVEMENT SCORES

	PICA scores					
Factor	***Overall***	***Gestural***	***III***	***V***	***VI***	***VII***
Age	.22	−.41	−.02	−.56	−.63	.55
Time post-onset	−.29	−.05	−.46	.01	.36	−.69

ture. Patients showed improvements similar to those noted in the 1982 report in the areas of auditory comprehension and pantomime. Unlike the patients in the 1982 study, however, patients in the present investigation showed significant improvement in verbal repetition.

These results support the hypothesis that bucco-facial apraxia may interfere with verbal performance. Furthermore, the results support Luria's suggestion that therapeutic emphasis on basic oral movements may be critical to the ultimate restoration of articulatory skill.

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APPENDIX

PROCEDURE FOR BUCCO-FACIAL VISUAL ACTION THERAPY

GENERAL INSTRUCTIONS

The goal of Bucco-Facial Visual Action Therapy (B/F VAT) is to train severely aphasic/apraxic patients to represent hidden objects with gestures involving the face and oral/respiratory apparatus. B/F VAT is a non-vocal method that employs a three-point scoring system (1.0 = correct; 0.5 = self-correct; 0 = incorrect) to determine progress up the 11-step, three-level program hierarchy. A score of 7.5/8.0 for each scorable step is the criterion for advancement to the next step or level.

The materials used are:

1. Eight objects: lollipop, whistle, perfumed artificial flower, telescope, cup razor, chapstick, and drinking straw with temporary contextual prompts (glass and liquid) if needed.
2. Large, shaded drawings of the objects on eight 5″ × 8″ index cards.
3. Small, shaded drawings of each object on 1½″ × 3″ cards.
4. Eight 3″ × 5″ action pictures depicting simple human figures manipulating each object.

PROGRAM HIERARCHY

LEVEL 1

Step 1: Large Picture Matching

Object-to-Picture Matching. The eight large object cards are arranged randomly in a line in front of the patient. The objects are then handed (one at a time) to the patient, who places them on the corresponding picture card.

Picture-to-Object Matching. The eight objects are arranged randomly in a line, and the object cards are given for placement on the objects.

Picture-to-Object Pointing. The eight objects are lined up randomly and the large pictures held up one at a time for the patient to see. The patient then must point to (not pick up) the object.

Object-to-Picture Pointing. The eight large pictures are lined up randomly, and the objects are held up one at a time as the patient points to the corresponding picture.

Step 2: Small Picture Matching

The four substeps described above in step one are repeated with the eight small object picture cards and the eight objects.

Step 3: Object Use Training

One at a time, the clinician demonstrates the use of each object and then places it in front of the patient to be picked up and manipulated in the appropriate manner. The clinician may need to redemonstrate some objects or shape the patient's performance to an acceptable level. A glass of water may be needed as a contextual prompt for the drinking straw.

Step 4: Action Picture Taking

One at a time, the action pictures are placed to the patient's left while the clinician manipulates the corresponding object appropriately. The object then is placed before the patient, the action picture is pointed out, and the patient is encouraged to perform the appropriate action. Once again, the clinician may need to shape the patient's performance.

Step 5: Following Action Picture Commands

The eight objects are arranged randomly and the action cards shown to the patient one at a time. The patient must locate the corresponding object and demonstrate its use. No contextual prompts are used at this stage.

Step 6: Pantomimed Gesture Demonstration

One by one the eight objects are placed on the table and the clinician produces a pantomimed gesture representative of the object so that the patient comes to understand that gestures can "stand for" objects.

Step 7: Pantomimed Gesture Recognition

The eight objects are arranged randomly, and the clinician produces representational gestures for each. Following each gesture, the patient points to the corresponding object.

Step 8: Pantomimed Gesture Training

One at a time, the eight objects are placed to the patient's left, and the patient is encouraged to produce a representational gesture for each. The clinician may need to shape an acceptable performance by allowing the manipulation of the actual object and then slowly removing it while the appropriate movement is maintained. The next step is not introduced, however, until the gestures can be produced without touching the objects.

Step 9: Pantomimed Gesture Production

The eight objects are shown to the patient one at a time, and the patient produces the appropriate representational gesture for each.

Step 10: Representational Gesture for Absent Object Training

Two randomly selected objects are placed in front of the patient, and the clinician produces the appropriate gestures for each. The objects then are hidden, and after about 6 seconds, one is brought back into view. The clinician then produces the gesture that represented the hidden object. In this manner, the clinician demonstrates the gestural representation of each object while it remains hidden.

Step 11: Representational Gesture for Absent Object

The patient must now gesturally represent each object while it remains hidden after being presented in random pairs.

LEVEL II

Steps 6 through 11 of level I are repeated with the action cards instead of the objects.

LEVEL III

Steps 6 through 11 of level I are repeated with the small object cards only.

DISCUSSION

Q = question; A = answer; C = comments.

Q. What kind of actual values are you talking about percentile-wise? Five percent difference? Ten percent? Do you know? Are these considered significantly different, functionally?

A. These patients could start repeating things after treatment, and that made them candidates for some verbal therapies. But I think that one of the important things was that the bucco-facial VAT sort of got them over the hump. Before then any attempt to use verbal therapies was unsuccessful. As we stated, these patients were inhibited by the severe bucco-facial apraxia. If you can just get "a toe in the door" so that a patient can start repeating words, then they can then move on to more traditional verbal programs.

Q. Can you comment on the relationship between bucco-facial apraxia and speech? I really don't understand the relationship.

A. Certainly there is literature to suggest that bucco-facial apraxia and verbal apraxia are not always correlated. We are using the term bucco-facial apraxia for nonverbal movements and noting that they were all nonfluently aphasic as well. They had little to no verbal output.

Q. If they are independent, why would you expect treating bucco-facial apraxia to affect speech, and what is the relationship?

A. We thought that for these patients there was a relationship between their nonverbal status and the bucco-facial apraxia.

Q. Well I mean theoretically it could be important to make the distinction between bucco-facial apraxia and apraxia of speech. Do you think you were treating their apraxia of speech even though you didn't use the term? Are you treating the same thing when you are treating bucco-facial apraxia as you are when you are treating apraxia speech? I am just wondering about the relationship.

A. The tasks were totally nonverbal, and then we saw improved verbal skills. What do you think was going on?

C. I really don't know what to think. I really don't know. I don't have good intuitions about bucco-facial apraxia and its relationship to the way one moves the speech structures when they talk. And I am not being coy. I really don't understand the relationships there. There are probably people here who understand that much better. Maybe Jay Rosenbeck or Chick LaPointe could respond.

A. We are not trying to be coy either. One of the reasons we did this, is to try and better understand the underlying mechanism. One thing we could get a hold on was that we had groups of patients who started out with global aphasia and severe limb and bucco-facial apraxia, treated the limb apraxia, by teaching them to make representational hand and arm gestures. What happened is that we got improvement in pantomime skills and, strangely enough, improvement in auditory comprehension, which is why you have to start thinking of this very seriously. But nothing happened to their speech, so then we said, "What can be going on here? Why wasn't there at least some improvement in repetition skills?" Well, we had not worked with the bucco-facial musculature. We redid the praxis test and we found that after the limb VAT they had only mild limb apraxia, but they still had severe or moderately severe bucco-facial apraxia. So our theoretical curiosity led us to explore the use of nonverbal face and oral gestures, sniffing, sucking, and blowing and so forth, to see what happened to their language test scores. And lo and behold, they started to use verbal language. So, of course, there has to be some sort of relationship between the two. In getting them to volitionally control the articulators for the purposes of representing things with a face and oral tongue movements, we got a change in their speech output.

C. You see theoretically that is very important if it is true that you can treat speech through non-speech means. That is an enormously important finding.

A. Luria always said you could do that. But we didn't get changes, as you notice, on other speech tasks such as their ablity to tell me what you do with each of these or even name them. That's why I said it's just "a toe in the door." Because now there is something they can do with speech volitionally, but it is just the ability to repeat some words. That is a long way from going on the 7 o'clock news.

Q. Did these guys have apraxia of speech?

A. If I was in Madison they would have apraxia of speech. Yes I would say so.

Q. Where did your treatment hierarchy end? I mean what could they do in the final stage?

A. At the final stage they were able to represent absent object pictures with oral/facial gestures. It was sort of a shell game. We put out pictures, covered them up, removed one, and then asked the patient to somehow show you what was still beneath the shield.

Q. What did you do next? I mean after they were through this program where did they go in treatment?

A. Some of the patients went on to melodic intonation therapy. Others went on to more traditional therapies.

C. I think where they went after that is important to solving the controversy that attends the relationship between speech and sound-making activities. I think that that is an important theoretical issue that might be helpful.

A. I would just like to say that I think it is important for us not to lose the notion of the relationship of learning to do something with your mouth, that is not talking, to help with talking. The issue of whether or not there is apraxic speech, that is, probably at least for today, an independent issue entirely. I think the thrust of the question was not about apraxia of speech and what you call it, depending on what side of the Mississippi you are on. But rather, what is the relationship, therapeutically, between nonverbal and verbal movements or licking a stamp and saying thank-you.