25. Effects of Verbal plus Gestural Treatment in a Patient with Aphasia and Severe Apraxia of Speech

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The effects of verbal plus gestural training, a form of intersystemic reorganization in which an intact gestural modality is paired with an impaired verbal one (Luria, 1970; Rosenbek, 1978), in order to improve verbal production in subjects with aphasia and apraxia of speech, have been demonstrated. Rao and Horner (1978); Kearns, Simmons, and Sisterhen (1982); Hoodin and Thompson (1983); Hanlon, Brown, and Gerstman (1990); and others have shown the benefits of such training in mildly, moderately, and severely aphasic individuals. Skelly, Schinsky, Smith, and Fust (1974) have noted its effectiveness for patients with apraxia of speech. However, no carefully controlled investigation of the effects of verbal plus gestural training has been reported for patients with aphasia and severe apraxia of speech.

The purpose of this study was to investigate the effectiveness of verbal plus gestural treatment for improving verbal production of single words in one nonfluent aphasic subject with severe apraxia of speech. In addition, generalization of verbal improvement was assessed across phonological contexts in various single-word tasks. The following specific experimental questions were included:

1. Will verbal plus gestural treatment lead to improved production of trained words with word initial phonemes /s/, /f/, /t/, and /l/?
2. Will improvements in verbal production generalize to untrained words with initial target phonemes and/or words with phonemes with similar phonetic characteristics (/z/, /v/, /d/, /n/)?

TABLE 25.1. APHASIA TEST DATA

Western Aphasia Battery		PICA[a] *Percentiles*	
SUBTEST	SCORE	SUBTEST	SCORE
Fluency	0	Overall	31
Comprehension	4.8	Verbal	7
Repetition	0.1	Auditory	21
Naming	0	Reading	21
Reading	2.6	Pantomime	36
Praxis	2.4	Writing	27
		Copying	37
		Visual	>35

[a]*PICA = Porch Index of Communicative Ability.*

/z/ and /v/ and 5 each for /d/ and /n/, were selected. Target items are listed in Appendix 25.A.

Baseline. All target stimuli were presented in three probe tasks that were administered in sequence for each item. First, the target picture was presented for oral naming; immediately thereafter the written word was revealed for oral reading; and, finally, each word was modeled by the clinician to evaluate word repetition. Probe tasks were presented across four consecutive sessions to ensure stable performance. All verbal responses in baseline and subsequent training phases were scored on-line by an observer situated behind a one-way mirror, and appropriate gestures were noted when present.

Verbal responses were coded using a 10-point multidimensional scale, shown in Appendix 25.B, that was developed on the basis of previously suggested scoring criteria (e.g., Collins, Cariski, Lonstreth, & Rosenbek, 1980). The scale was sensitive to the nature of verbal responses both phonemically and semantically, and took into account response features such as completeness, delay, self-correction, and perseveration. For the purpose of data analysis, responses coded as 6–10 were considered correct responses.

Treatment Phase. Each treatment session began with the administration of the probe task for all trained stimuli and a portion of the untrained stimuli. Probe stimuli were randomized and counterbalanced across sessions. Responses to these probes served as the dependent variable throughout the study.

Following probes, treatment was administered for one target phoneme, keeping the other targets and untrained stimuli in baseline condition to

assess patterns of response generalization. Treatment was presented in sequence across time for /s/, then for /f/, next for /t/, and last for /l/ target words. Treatment continued for each target phoneme until a criterion of 80% correct for all probe tasks was reached or until 20 treatment sessions were completed.

The verbal plus gestural treatment sequence proceeded as follows:

1. With the target picture placed in front of the subject, a model of the verbal and gestural target was provided.
2. The gesture was elicited in isolation following a gestural model.
3. The target verbal response was elicited alone following a verbal model.
4. The verbal and gestural responses were modeled together for the subject to produce simultaneously.
5. The verbal plus gestural response was elicited without a model.

Each training item was presented two to three times per treatment session.

Reliability

All probe sessions were videotaped and scored for reliability purposes by an independent judge. Responses coded within 1 point on the 10-point scale were considered to be agreements. Overall, point-to-point agreement calculated on every third probe session was 88%, ranging from 77% to 99%.

RESULTS

Verbal Responses

The results are summarized in Figures 25.1–25.4. Because performance in the written word probe was consistent with that in the oral naming probe, only oral naming results are presented along with those of the repetition probe. The graphs display the number of correct oral naming responses, indicated by open circles, and correct responses for repetition, indicated by closed circles.

Figure 25.1 depicts performance for three training targets: /s/, /f/, and /l/. For /s/ training, although the baseline was rising for the repetition condition, oral naming performance was low and stable. As training was
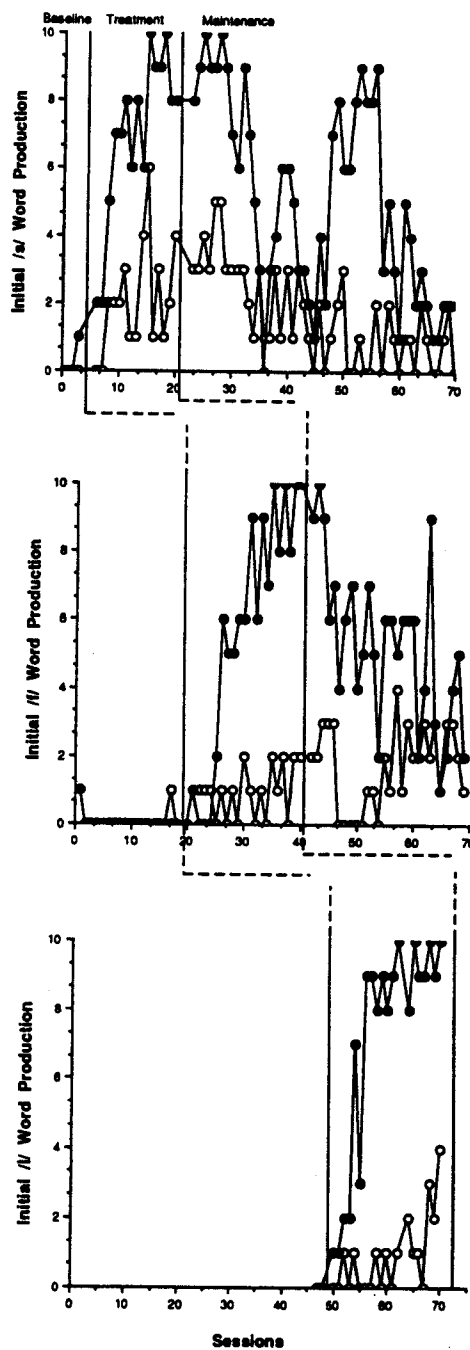
Figure 25.1. Number of correct productions of trained target words with initial /s/, /f/, and /l/ across all phases of the study. Correct oral naming is indicated by open circles, and correct repetition by closed circles.
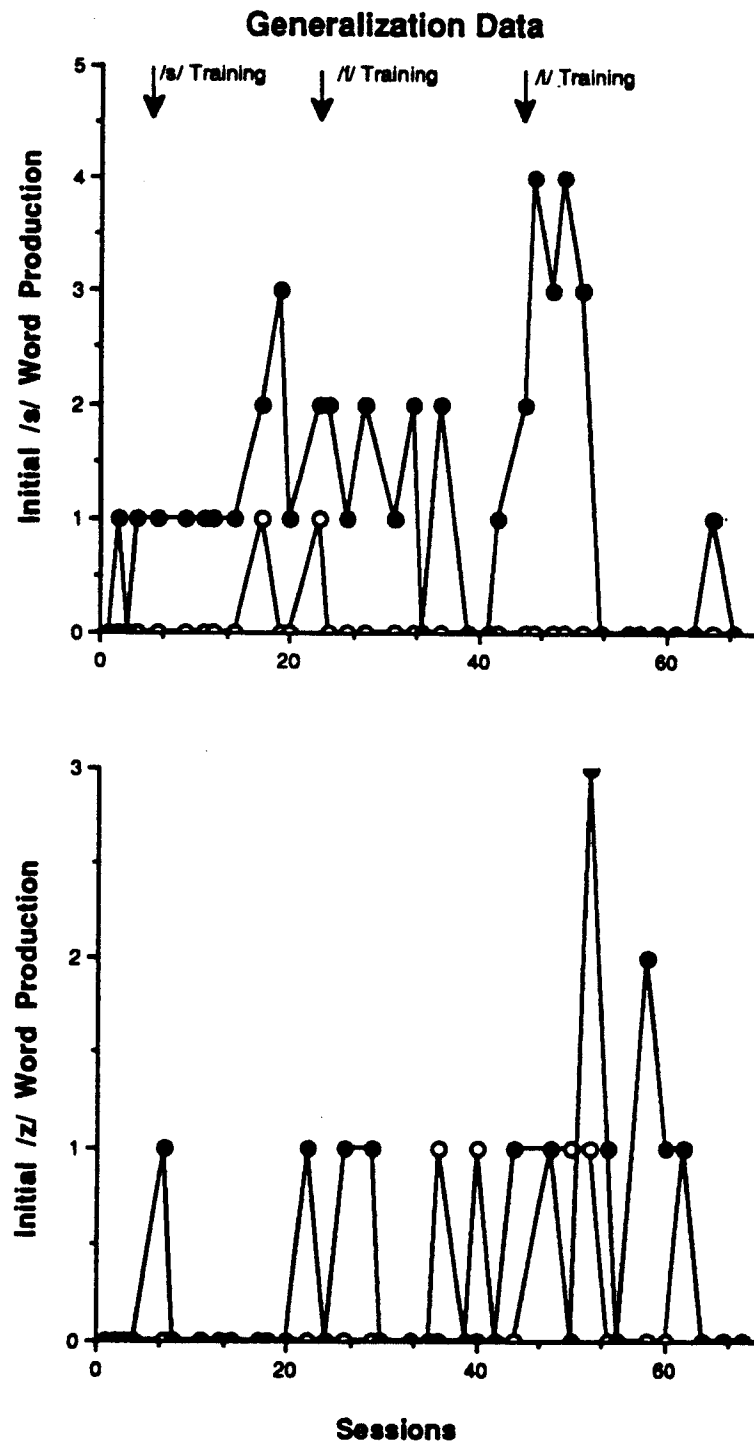
Generalization Data

Figure 25.2. Number of generalized correct productions of untrained exemplars with initial /s/ and /z/ words. Correct oral naming is indicated by open circles, and correct repetition by closed circles. Arrows indicate session in which training was initiated and discontinued.

Generalization Data

Figure 25.3. Number of generalized correct productions of untrained exemplars with initial /f/ and /v/ words. Correct oral naming is indicated by open circles, and correct repetition by closed circles. Arrows indicate session in which training was initiated and discontinued.

Figure 25.4. Number of generalized correct productions of untrained exemplars with initial /l/ and /n/ words. Correct oral naming is indicated by open circles, and correct repetition by closed circles. Arrows indicate session in which training was initiated and discontinued.
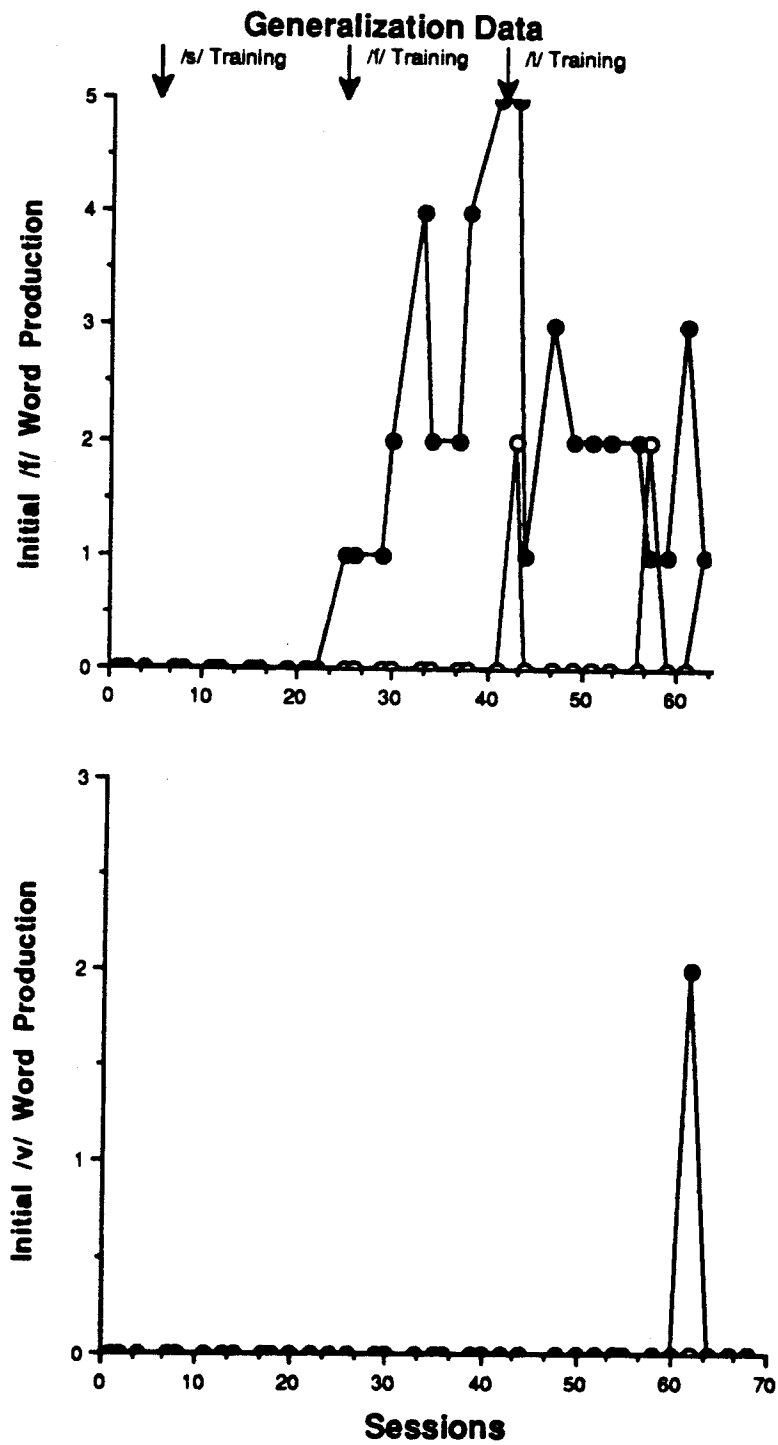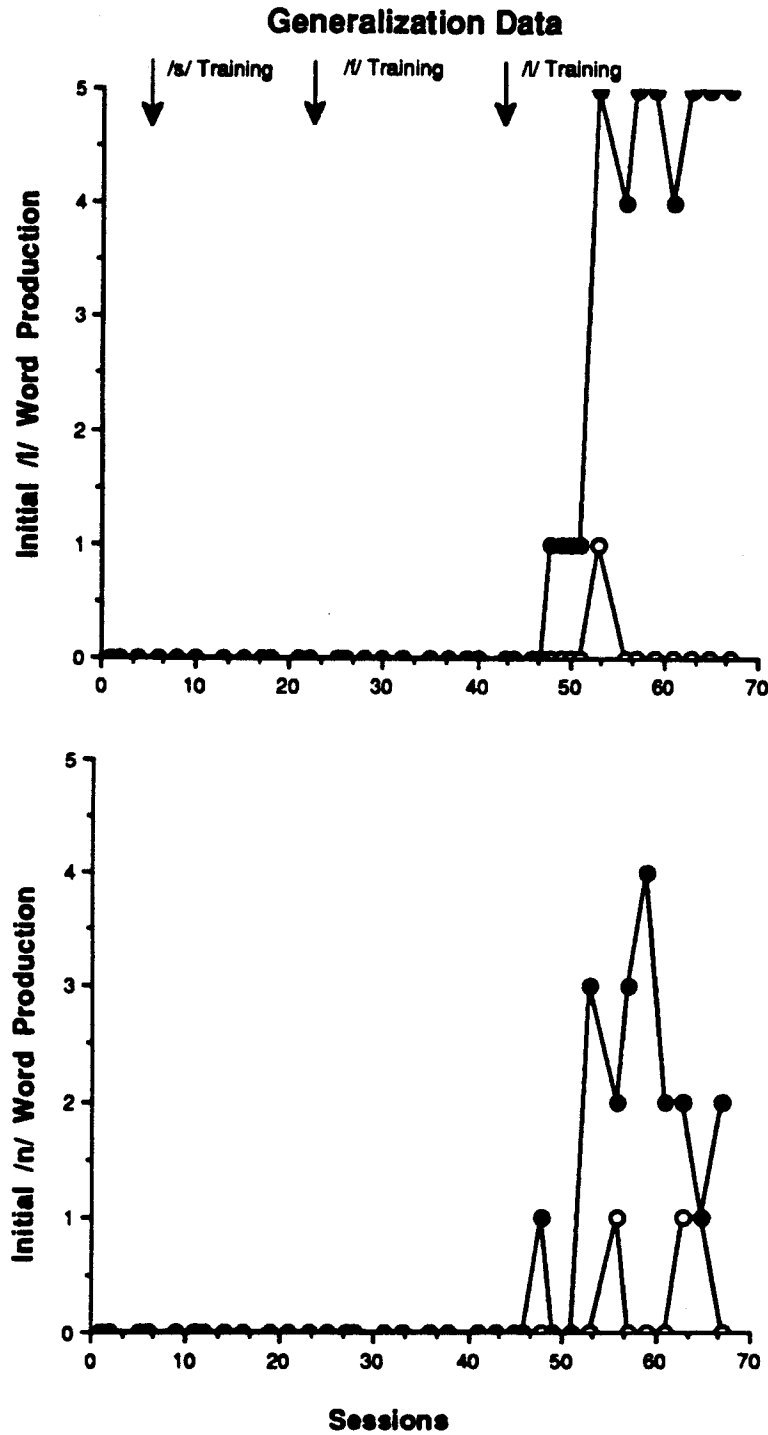
instituted for /s/ targets, further improvement to criterion levels was noted in the repetition condition. However, the criterion for oral naming was not achieved. Variability in correct oral naming was seen throughout training as well as increased attempts to pronounce selected target words incorporating one or two accurate phonemes.

Similar results were noted when /f/ and /l/ targets were treated. Repetition improved to criterion levels, but only limited change was noted for oral naming. Training results for the /t/ targets are not shown. The subject was unable to learn this set of target words, despite repeated efforts.

Generalization data are presented in Figures 25.2–25.4. Results for /s/ and /z/ shown in Figure 25.2 indicate generalized repetition of the untrained /s/ exemplars during /s/ training, with no change noted in oral naming. Although no generalization is evident for /z/ exemplars, it was noted that responses in repetition incorporated substitutions of the voiceless /s/ for the initial voiced /z/. Figure 25.3 shows a similar pattern of generalization for repetition of untrained exemplars of /f/ and /v/ when /f/ training was instituted. In Figure 25.4, however, generalized repetition was noted for untrained exemplars of both /l/ and /n/ during /l/ training. Again, no change was evidenced for oral naming.

Overall, for three of four target phonemes, repetition improved and generalized to untrained exemplars and related phoneme exemplars. Little improvement of oral naming was demonstrated.

Gestural Responses

It is of interest to note the relationship between gestural productions and oral naming responses. An indication of the importance of using a gesture to elicit an accurate oral naming response was given by identifying the percentage of correct responses accompanied by a gesture across baseline and treatment conditions. During baseline probes, gestures accompanied only 5% of oral naming attempts, none of which were correct oral naming responses. At the completion of training, gestures accompanied 45% of oral naming attempts, 61% of which were paired with correct oral naming responses.

CONCLUSIONS

The results of this experiment demonstrate that this severely impaired apraxic subject improved in only some aspects of verbal production when verbal plus gestural treatment was administered. Although improvement was restricted largely to repetition skills, generalized repetition was

noted for untrained exemplars of the target phonemes and related pho-
nemes. We also documented an overall increase in the use of gestures
following treatment and noted increased gestural facilitation of verbal
responses across time. However, these data indicate that gestural plus
verbal treatment did not markedly improve either oral naming or oral
reading ability.

Why was there little generalization to the more volitional oral naming
and oral word-reading tasks? Perhaps the subject's concomitant aphasia
was a crucial factor. However, comparably impaired aphasic subjects
reported by Kearns and colleagues (1982) and Hoodin and Thompson
(1983) demonstrated improvement in naming abilities with verbal plus
gestural training. The difference in our subject appears to be his addi-
tional severe apraxia of speech.

Although verbal plus gestural treatment may be considered a form of
intersystemic reorganization, pairing a more intact gestural modality
with the impaired verbal modality, results of this study indicate a limita-
tion in the extent of verbal reorganization that may be anticipated when
severe motor speech deficits accompany language deficits. A similar find-
ing was noted by Hanlon and colleagues (1990) for a patient with severe
dysarthria.

A final factor to consider with respect to the lack of improvement in
volitional verbal skills in this subject is the subcortical extent of his infarc-
tion. Lesions extending deep to frontal periventricular white matter have
been associated with increased severity of verbal impairment and less
recovery of function (Alexander, Naeser, & Palumbo, 1987; Brunner,
Kornhuber, Seemuller, Suger, & Wallesch, 1982). The significant involve-
ment of deep white matter tracts in our subject may have limited the
potential for improvement of verbal skills.

Clearly these findings await replication in similarly impaired subjects.
However, they contrast with the optimism regarding the effects of other
similar gestural treatment programs for severely impaired subjects (Wertz
et al., 1984). Indeed, the prognosis for improvement of volitional aspects
of verbal output in the severely impaired apraxic subject remains guarded.

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APPENDIX 25.A
EXPERIMENTAL WORD LISTS

Trained Words

/s/	/f/	/t/	/l/
soup	fish	tea	leaves
salt	feet	tub	large
sun	fork	tire	long
sock	farm	ten	laugh
suit	four	tail	loud
six	food	talk	lips
sew	five	two	left
sail	fight	tear	lion
sit	fill	toes	link
sing	phone	tent	look

Untrained Words

/s/	/f/	/t/	/l/
sink	face	tie	lick
soap	fan	teeth	leg
saw	fire	tool	lamp
sip	fence	type	lock
sick	fix	tongue	lift

/z/	/v/	/d/	/n/
zoo	vine	dust	neck
zip	vest	desk	knee
zero	vase	door	knife
		dog	nose
		dive	knock

APPENDIX 25.B
SCORING PROTOCOL
FOR VERBAL RESPONSES

10   Immediate, correct, complete

9   Distortion—Overall movement correct, but defective in amplitude, speed, accuracy, or prosody

8   Delayed, followed by correct or simple distortion

7   Self-correction of previous incorrect response

6   Correct following repetition cue

5   Partial response—Substitution or addition of one phoneme of a word

4   Delayed, incomplete

3   Incorrect identifiable word that is phonemically different from target word by at least two phonemes

2   Partial response—At least one recognizable phoneme of the target response

1   Unintelligible, undifferentiated response, or perseveration of previous response

0   No response