Below the 50th Percentile: Application of the Verb as Core Model

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Previous studies have supported the idea that using the verb as the pivot training unit results in enhanced communication abilities (Loverso, Selinger, and Prescott, 1979; Prescott, Selinger, and Loverso, 1982; Loverso, Prescott, and Selinger, 1985). This treatment paradigm approaches language theory by centering all language procedures around the verb. That is to say that the verb may be the core of all simple sentences (Rumelhardt and Norman, 1975; Rumelhardt and Levin, 1975; Lindsay and Norman, 1971; Bever, 1970; Fillmore, 1968).

Definition of the major elements in a sentence into subject-verb-object form simlifies the grammatical complexities resulting from transformations. Generating sentences by asking wh-questions about the verb (core) may tap the most useful and meaningful aspect of language and may be one of the most efficacious types of stimulation in aphasia treatment (Loverso, et al., 1979; Loverso, et al., 1985; Prescott, et al., 1982).

Application of the verb as core model to a specific treatment program has been previously described in the literature (Loverso et al., 1979; Prescott et al., 1982). This treatment involved two major levels each of which had two sublevels. Table 1 lists these levels.

Table 1. Original verb treatment protocol.

Level I:	Given the verb, supply a subject
Level Ia:	Given a subject-verb sequence, copy and imitate it
Level Ib:	Given the verb, choose a correct subject from an array of four
Level II:	Given the verb, supply a subject and an object
Level IIa:	Given the subject-verb-object, copy and imitate it
Level IIb:	Given the verb, choose a correct subject from an array of four and choose a correct object from an array of four

In Level I subjects were cued for the subject by being asked wh-questions in relation to the verb provided. In Level II subjects were cued for both the subject and object by being asked wh-questions in relation to the verb provided. Sublevels Ia, Ib, IIa, and IIb were used to simplify and increase the structure for subjects who were unable to score above 60% on the two main levels. The two subjects in the original study (Loverso et al., 1979; Loverso et al., 1985) improved their communicative abilities as measured by the PICA (Porch, 1967) and these improved scores were maintained after treatment was completed.

Prescott et al., 1982 have also investigated generalization learning using the verbing approach and a multiple treatment design. It was found that learning of the verbs trained generalized to verbs not trained.

The verbing approach has also been implemented in investigations using both clinician presentation of stimuli and microcomputer presentation. A single-subject report (Loverso, Prescott, and Selinger, 1985) states that "although the clinician was more efficient in terms of the number of visits required to learn the task, the microcomputer was shown to be an effective but slower treatment tool) (p. 192) "External PICA probes indicated clinically meaningful and statistically significant ($p < .01$) differences between levels from baseline to completion of this program." (p. 191) These findings are currently being extended with a larger population.

In all previously reported investigations using the verbing technique the major requirements for inclusion in the program was one neurological episode and Overall PICA scores that were at or above the 50th percentile. Because of consistent improvement exhibited by patients on this program it was felt that the program may be adaptable to patients with marked to severe aphasia. Not only does the program seem to tap into a basic level of language but its presentation bombards the subject with visual and auditory information and requires verbal and graphic output. In addition, the use of a microcomputer may facilitate graphic output by eliminating writing with the nondominant hand.

The purpose of this paper was to investigate the following questions. 1) Does the verbing program work with patients exhibiting moderate to severe aphasia? 2) Can moderate to severe aphasic patients master the computer mechanics necessary to participate in the program?

METHOD

Subject. The subject was a 52-year-old male who suffered a left hemispheric CVA five months prior to admission to our clinic. The patient was premorbidly right handed. CAT scan indicated a left internal capsule lesion. The patient presented with paralysis of the right arm and paresis of the right leg. Initial diagnostic testing generated an overall PICA score at the 24th percentile. Traditional treatment for aphasia was implemented and continued for four months. After four months of traditional treatment the patient's PICA Overall was at the 32nd percentile. At this time the verbing treatment was begun.

Procedure. Initially the verb program was presented to our subject in its original sequence. Level Ia was completed in 28 sessions, including an initial 7 sessions which were used to train computer mechanics. This was 24.5 sessions greater than the mean of subjects whose PICA Overall scores were at or above the 50th percentile.

Following completion of Level Ia a PICA was administered and then Level Ib was begun. The subject had difficulty with this level (18-32% correct over 4 sessions). Completion of one session took almost two hours, which caused a great deal of fatigue and frustration. We examined the overall scores on Ib using Chi Square (Winer, 1962) following 4 treatment sessions. Our subject's Chi Square value did not exceed the accepted score at $p < .05$ and therefore we considered the measured behaviors to be random. Level Ib was terminated at this point. The program was revamped. At first the array of four choices for the actor in level Ib was reduced to two. This did not facilitate an increase in performance.

At this point the verb program was reanalyzed in terms of its organization. The program was originally designed hierarchically, with increasing difficulty based on syntax. The program began at the subject-verb level with the subject and verb given, then the verb given and the subject chosen, then the verb given and the subject self-generated. Then the same sequence was repeated but with a more complex subject-verb-object form. Now the program was redefined for more severe patients in terms of task complexity. Tasks were designed to proceed with copying, choosing and then self-generating. First subject-verb was imitated and copied, then subject-verb-object was imitated and copied. Following the reorganized Level I we began Level II which included selection and graphic copying and then verbal generation of, first, subject-verb sequences and then subject-verb-object from an array of four choices. Last was self-generation (verbally and graphically) of the two sequences, i.e. subject-verb, subject-verb-object. Table 2 illustrates the new verb sequence. It was expected at the outset that severe patients might not ever be able to complete the self-generating levels of the program.

Table 2. Revised verb treatment protocol.

Level Ia:	Copy the subject-verb sequence given
Level Ib:	Copy the subject-verb-object sequence
Level IIa:	Choose a correct subject for the verb [provided] from an array of four
Level IIb:	Choose a correct subject and then a correct object for the verb from two arrays of four each.
Level IIIa:	Given the verb, generate a subject for it (I)
Level IIIb:	Given the verb, generate a subject and object for it (II)

Basic procedures remained the same for both versions of the program. The subject was required to attain a score of at least 90% correct for 3 consecutive sessions before a new treatment level was initiated. A PICA was administered to the subject following completion of each sublevel of the program.

Using the new treatment protocol the subject started again at level IIa and reached criteria in 21 sessions. Level Ib was reinstituted at this point. Over 8 sessions the subject continued to perform at levels below 50%. Treatment time for the sessions was over 1½ hours and the subject became fatigued and frustrated. At this point treatment was terminated.

RESULTS

The PICA (Porch, 1967) was used as the external measure of changes in communicative abilities. In order to determine if there were any systematic differences in language abilities, a one-way Analysis of Variance (Madigan and Lawrence, 1982) with repeated measures was performed on PICA scores for each PICA including pre-verbing, after each verb level and one month after treatment was terminated, resulting in nine PICA scores for our subject (Figure 1). These nine PICAs were administered over a period of eleven months. We divided the nine mean PICA Overall scores into two groups. Group 1 contained

pre-verbing scores while Group 2 contained post-verbing scores. Group 1 is represented in Figure 1 as tests 1-4 and Group 2 is tests 5-9. Using the ANOVA yielded a significant test effect [$F(8,136) = 14.80$, $p < .001$]. These findings indicated that there was a difference in PICA scores between treatment periods.

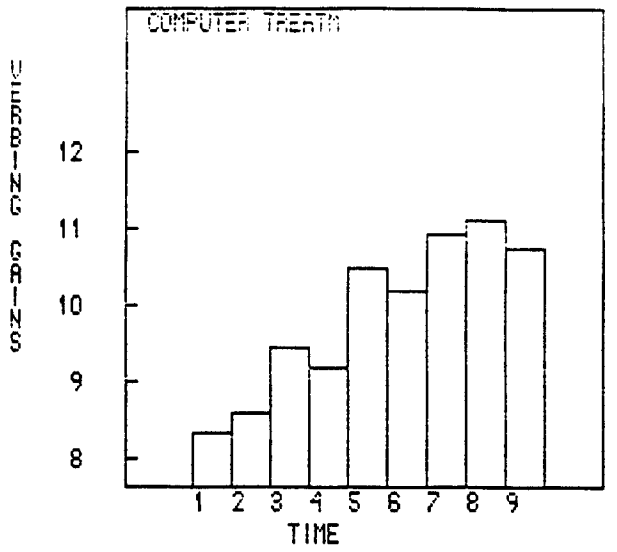

Figure 1. Porch Index of Communicative Ability scores following treatment periods. Bars 1 to 4 are scores before the verbing program was begun.

Post hoc analysis of the test effect employing the Tukey procedure (Winer, 1962) indicated that PICA scores for pre-treatment and traditional treatment periods were significantly different ($p < .01$) from PICA scores following implementation of the verbing approach. Particular differences were seen following the completion of level IIa. In addition, it should be mentioned that post-verbing differences were maintained one month after treatment was terminated. Table 3 illustrates these results.

In order to examine more specific changes in the communicative abilities of our subject we used one way ANOVAs to look at changes in the subtest scores of our subject over the 9-month period of this investigation. Subtests 1, C, and D were the tests we predicted would exhibit the most meaningful changes. These subtests had been the strongest predictors in previous analyses of other subjects. Indeed, the ANOVA for Subtest 1 indicated statistically significant [$F(8,72) = 6.12$, $p < .001$] verbal changes over the test period. A post hoc analysis using the Tukey procedure (Winer, 1961) indicated differences in scores which mirror those reported for the overall PICA scores. In other words, a meaningful difference ($p < .01$) occurred following the implementation of the verbing program, with the largest changes occurring after implementation of level IIa and the repetition of level Ib (Figure 2). Scores are represented in Figure 2 as V and VII. The one way ANOVA analyses of Graphic tests C and D indicated no significant differences over the testing period.

Table 3. PICA scores for the subject in the study.

DATE	MPO	PICA SCORES OA	GST	VRB	GRPH
PRE-VERBING					
10-1-85	5	24	18	29	34
11-6-85	6	26	21	31	31
12-4-85	7	36	32	44	37
1-15-86	8	32	23	37	41
VERBING BEGINS					
4-7-86	11	45	43	43	48
4-30-86	11	41	35	41	48
7-9-86	14	48	45	50	49
8-13-86	15	52	70	46	49
1 MO. POST TREATMENT					
9-15-86	16	48	49	44	51

Note. MPO = months post onset, OA = Overall, GST = Gestural, VRB = Verbal, GRPH = Graphic

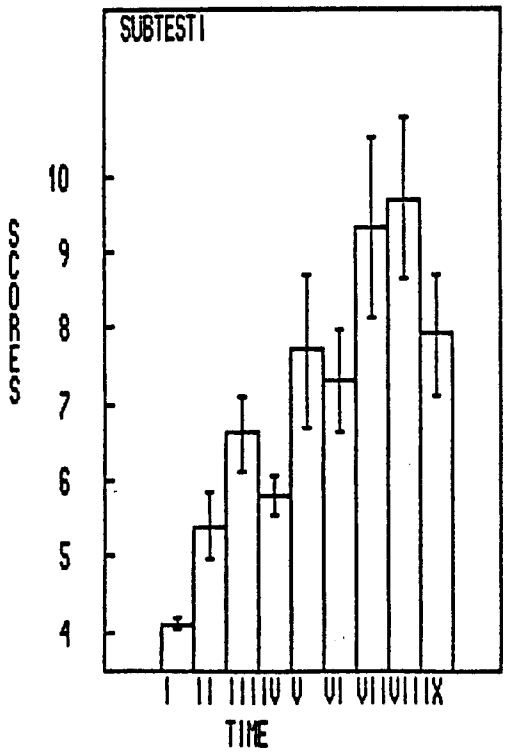

Figure 2. Porch Index of Communicative Ability scores for Subtest 1. Periods 1 to 4 are preverbing scores.

CONCLUSIONS

The current investigation asked two basic questions. Is the verbing approach beneficial to aphasic patients who exhibit marked to severe aphasia? Can these patients learn the skills necessary to use the microcomputer presentation of the verb program?

Results indicated that the patient made significant gains on the external measure after the verbing program was initiated, and those gains were maintained after treatment ended. Use of a single-subject model allowed for the step-by-step adaptation of the program to the patient reported here. Ultimately, a new aspect of the original verbing program was developed to treat a full spectrum of severity levels. Reorganization of the program for this patient allowed him to proceed through 2 of the 6 levels with practice in seeing, hearing, copying, and repeating the tasks at two levels of syntactic complexity. In the original sequence he would have had to complete more complex tasks at the subject-verb level before getting to the subject-verb-object level. Having experienced the difficulties the subject had with the tasks of choosing and self-generation it is probably accurate to say that he might not have progressed to more complex syntactic levels because of the inherent difficulty of the task in its original sequence. Instead, the patient was able to mass practice a basic level of language.

That the significant changes occurred after the verbing program began is consistent with the findings of our original study, which indicated that significant changes occurred after level I. Subsequent levels maintained the initial benefits but did not differ from one another significantly. It may be that the combination of the subject-verb kernel and the nature of the presentation (auditory and visual stimulation with verbal and graphic output) is the meaningful difference regardless of other tasks and amount of complexity. This certainly seems to be the case with the subject reported here. In fact, it could be argued that once the subject-verb form is learned, generation of the object is similar to finishing a sentence or carrier phrase. Beyond level I everything else may simply be practice.

It is particularly interesting that the results from subtest I indicated a significant difference between the first sequence of level Ib (choosing the subject from an array of four) and the second sequence of Ib. These differences imply that the extended practice of both subject-verb and subject-verb-object at the imitation-copying level facilitated learning for Level Ib.

In addition, all of the levels completed by the patient were administered by computer with clinician input, feedback, and teaching. Although the patient took 7 sessions longer to become as facile with the computer as patients whose percentiles fall above the 50th percentile on the PICA, he was able to learn the mechanics and progress through the program in a manner similar to less severely aphasic patients.

However, when we examined changes in specific graphic subtest scores over the period of the investigation, no changes were observed. In the past, subjects have exhibited significant improvement in graphic scores on subtests C and D (Loverso et al., 1979). There are two possible explanations for the observed differences. First, the subjects reported on initially did not use the microcomputer for their graphic output. Our subject used the microcomputer. Perhaps this subject would have made gains consistent with those previously reported if his graphic practice had been with a pencil rather than a keyboard. However, in a study reported by Selinger, Prescott, and Katz in this volume, no differences in PICA graphic scores have been found when subjects responded with a pencil versus the computer keyboard. Therefore, the second

interpretation of the data reported here could be that since our subject began the program at the 34th percentile and the subjects previously studied were at the 50th percentile or above we may be comparing limitations imposed by severity rather than modes of graphic output.

The preliminary results from this investigation lead us to conclude that the philosophical basis of the verbing approach may be applicable to patients who fall in severity ranges below the 50th percentile on the PICA. In addition, the verbing program in its reordered form has been adapted specifically for a more severe patient and was an efficacious treatment paradigm for our subject.

Although the use of the microcomputer has raised some issues as to its possible limitations for graphic improvement, it was used efficiently by our subject. The microcomputer presents the program smoothly and clearly to the subject, it gives repeats and visual feedback. The program allows the patient to produce clear and easily correctible graphic responses. All in all we feel that patients with marked to severe aphasia may benefit from computer presentation of the verbing program, especially as an adjunct to direct clinician intervention.

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DISCUSSION

Q: What kinds of changes did you see in the patients' spontaneous speech? What kinds of changes did you see on PICA performance?

A: In terms of the spontaneous speech, when he first came in to see us he exhibited lots of refusals on the PICA for verbal output. In spontaneous kinds of talking it was mostly "son-of-a-bitch" and "shut-up," then we began to see some sentences like "I worked hard" or "This was difficult." There was not a lot of output, he did not become a conversationalist. The same kind of changes were similar on the PICA: a general overall rise.

Q: Do you use this technique with fluent aphasics below the 40th percentile?

A: We have not used it yet, it's something that we might try but we have not applied it yet, and in fact we haven't run across anyone to apply it to yet....a fluent aphasic below the 50th percentile.

Q: Now that you have some good information about using computers with patients at this level of severity, would you do it in lieu of not using the compute: and presenting the materials live?

A: I would use it, but I would use it with a clinician and computer together. Previously we've looked at the two separately. I think that in the case of the severe patient it was nice for them to have us sitting there encouraging and teaching them but they feel some success at having conquered the computer. They're very pleased that they can do it. They like the visual feedback and the music that plays at the end of the session if they scored 100%. They feel good about what they're doing. It's clear and efficient. I would definitely suggest it.

Q: Do you teach a grammatical model for classifying verbs?

A: We classified the verbs by action verbs. We used a Case grammar originally described by Fillmore. We used the verb as the central core as Fillmore originally depicted it. We controlled for frequency and length.

Q: You commented about generalization to spontaneous speech and you mentioned things like the patient said "it is difficult" and "difficult" is harder than other verbs. Do you see generalization across different types of verbs? I mean a concrete verb being quite different from say an experiential verb like "want" or "feel" or the verb "to be."

A: I don't know for sure. He came up with surprisingly difficult sentences when it was all over. We did look at high and low emotional verbs in 1979 and saw no difference. In 1985, we did a study to see if learning one list of verbs generalized to verbs not taught and there was generalization. We didn't however, classify the verbs according to specific categories like easy and hard.

Q: I'd be curious if you could explain to us a little bit more about what kind of graphic presentation you used. Were they simply letters or did you use enlarged alphabets, depictions of things, combination of these sorts of feedback on the computer?

A: What he saw on the monitor? Depending on the level, what they see is a line before the verb and the verb. Then that with a wh-question above the blank line and the computer says the wh-question and the verb, and that printed visual presentation plus the computer voice is varied

according to what level the patient is working on. Underneath the stimulus is a blank line where the patient copies or generates the graphic responses.

Q: You mentioned earlier that if you had your preference you'd rather have the clinician and the computer working with the patient now. Your previous report a year or two ago you said that both the clinician phase and the computer phase were instrumental in getting the patient to perform to criteria but the clinician was faster. Have you compared those conditions to a computer plus clinician condition? If not why would you want to use both the clinician and the computer together?

A: We've not done that yet. The reason I would want to do it with a patient like the one we looked at is a clinical intuition. When we spend over two hours of groping for letters on the keyboard and struggling with verbal output and spelling errors, I think having us sitting there and looking at him, and encouraging him, and often teaching him, is beneficial. The other computer program presents the stimuli. It doesn't cue or teach in any way. Having the clinician there to do some cueing and some encouragement and some feedback kept that man going over those long periods of time working on thirty verbs. Now that's purely a clinical intuition, but I have the sense that had I said "alright, sit down here I'll be back in two hours," or "I'll check on you in an hour" that he wouldn't have been there when I checked.

Q: Do you feel that would require a certified speech and language pathologist or could some other form of clinical input like an aide or tech being supervised accomplish the same in your program?

A: My real feeling about it is that a certified speech pathologist would do this particular thing better. It might be less of an issue with a higher-level patient.