CHAPTER

27

Reducing Phonemic Paraphasias in the Connected Speech of a Conduction Aphasic Subject

Mary Boyle

When we think about conduction aphasia, the characteristic that usually comes to mind first is the repetition deficit. The repetition deficit is important for diagnostic purposes, but it usually has little functional impact on the patient's communicative ability. These patients are typically most frustrated by the phonemic paraphasias that occur during their spontaneous speech. Unfortunately, there are few data available regarding treatment techniques that can improve speech sound production in the connected speech of these individuals. The purpose of this chapter is to share the preliminary results of a treatment program that was successful in reducing the number of phonemic paraphasias in one subject's speech.

In setting out to devise the treatment program, it seemed that an approach focused on oral reading might be useful. Joanette, Keller, and Lecours (1980) and Nespoulos, Joanette, Ska, Caplan, and Lecours (1987) have shown that conduction aphasic patients are able to improve word productions during oral reading tasks. These investigators theorized that the visual stimulus provided a constant external reinforcement of the target and allowed subjects to access their visual-verbal system, which was more intact than their auditory-verbal system. Because they were using a more intact system, the subjects were able to improve their monitoring ability. This is compatible with the notion of intersystemic reorganization, which advocates use of a more intact system to improve performance of an impaired system. The use of intersystemic reorganization to treat neurogenic speech and language symptoms has been recommended by LaPointe (1978), Luria (1970), and Rosenbek (1976), among others.

It seemed possible, therefore, that a treatment program focused on oral reading might improve the speech-sound production of conduction aphasic patients in connected speech. The hypothesis was that an oral reading treatment program would do several things:

1. It would reduce the occurrence of phonemic paraphasias and the number of reapproaches per paraphasia by improving the patient's monitoring ability.
2. It would slightly reduce the patient's speaking rate, which would reduce the work load of the monitoring systems and thus also contribute to more accurate speech-sound production.
3. It would improve the efficiency of speech as measured in content units per minute (Yorkston and Beukelman, 1980) by enabling the patient to produce more words (and thus more content units) accurately.

SUBJECT

N.K. was a 60-year-old right-handed male with a tenth-grade education. When I met him, he was 1 year, 3 months post-onset of a left cerbrovascular accident (CVA). The CVA resulted in conduction aphasia and a mild sensory deficit of the right upper limb. A computed tomography (CT) scan done approximately 1 week post-onset revealed an infarct in the left temporoparietal area. The sensory deficit of the arm and hand quickly resolved, but the aphasia remained. N.K. had been receiving aphasia treatment as an outpatient for 14 months. At the time I met him, he continued to demonstrate fluent speech frequently contaminated by phonemic paraphasias, severely impaired repetition, and mild auditory comprehension impairment. The profile of scores on the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1983) was compatible with a diagnosis of conduction aphasia. N.K. stated that the most annoying aspect of his disability was the frequent occurrence of paraphasic error. This was the only aspect of his speech that he wanted to continue to work on.

METHOD

Accordingly, a treatment program using oral reading tasks was prepared in the hope that it would improve speech-sound production in connected speech. A modification of an ABAB withdrawal design, consisting of a baseline phase followed by a treatment phase, a withdrawal phase, and a second treatment phase, was used to evaluate treatment effectiveness (McReynolds and Kearns, 1983). In this case, the lengths of the phases were unequal, and no data were collected during the withdrawal phase. This occurred because N.K. had a seizure and lost consciousness several days after the sixth treatment session. He was hospitalized for 3 days of observation. There was no clinical evidence of a new stroke and a subsequent CT scan showed no evidence of new damage. N.K. did not resume treatment for 8 weeks due to transporation problems. Following his return, measures were taken during 3 sessions without treatment. In general, these measures indicated a return to previous baseline measures. Because N.K. wanted to resume treatment quickly at this point, the second treatment phase was initiated.

Baseline measures were made by audiotaping N.K.'s description of the Cookie Theft picture from the BDAE at 1-week intervals. The measurements that were made were

1. Percentage of words containing phonemic paraphasias.
2. Length of phonemic reapproach sequences.
3. Speaking rate (syllables per minute).
4. Efficiency (content units per minute).

The patient was seen once a week for a 50-minute treatment session. Treatment stimuli consisted of three sets of word, phrase, and sentence lists. The first set targeted one-syllable words; the second, two-syllable words; and the third, three-syllable words. Each list contained 20 items. Within each set, word lists were presented first, followed by phrase lists, then sentence lists. Figure 27-1 shows examples of stimulus items. Criterion level for progressing through lists within sets, and from one set to the next, was 80 percent accuracy on two successive trials. Production of a phonemic paraphasia prompted use of a cuing hierarchy:

1. N.K. was instructed to look at the word and think about how it should sound, then read the word again.
2. If this failed, any stimuli before and after the target were covered and N.K. read the target again.
3. If this failed, a model was provided by the clinician, and N.K. read the word again.
4. If this failed, attempts to produce that target were abandoned.

Figure 27-1. Examples of stimulus items used in the treatment program.

	WORDS	PHRASES	SENTENCES
ONE-SYLLABLE	LOCK	LOCK THE DOOR	I WILL LOCK THE DOOR.
	DOWN	DOWN THE ROAD	HE DROVE DOWN THE ROAD.
	CHAIR	BIG CHAIR	THE BIG CHAIR IS RED.
TWO-SYLLABLE	FORGOT	I FORGOT	I FORGOT ABOUT IT.
	EXPLAIN	EXPLAIN IT	PLEASE EXPLAIN IT TO ME.
	JACKET	NEW JACKET	I BOUGHT A NEW JACKET.
THREE-SYLLABLE	TERRIBLE	TERRIBLE COLD	I HAVE A TERRIBLE COLD.
	FANTASTIC	FANTASTIC TIME	WE HAD A FANTASTIC TIME.
	DISHWASHER	A NEW DISHWASHER	HE BOUGHT A NEW DISHWASHER.

Treatment probes (tape recordings of the Cookie Theft picture description) followed each treatment session. Treatment was terminated when N.K. failed to reach criterion on the three-syllable phrase lists after four treatment sessions. Follow-up measures were obtained 6 weeks after treatment had been terminated.

The audiotapes were transcibed verbatim by two judges. Half of the transcriptions were randomly chosen to assess reliability of transcription. Analysis yielded 98-percent intrajudge and 94-percent interjudge point-to-point agreement.

RESULTS

Figure 27-2 shows the percentage of words that contained phonemic paraphasias. Although there is not evidence of experimental control of this variable during the first treatment phase, the occurrence of phonemic paraphasias decreased during the second treatment phase after session 10. Phonemic errors remained at a low rate for the remainder of treatment and stayed below baseline measures 6 weeks after treatment had been terminated.

Figure 27-3 shows the number of phonemic reapproach sequences and the range of sequence lengths during each session. If you look at the initial baselines, you can see that it is not possible to claim strict experimental control of this variable because neither a stable baseline nor a baseline trend opposite to the expected treatment effect was obtained. It can be seen, however, that during the last five treatment sessions (T12–T16), N.K. made no more than one or two attempts to correct an erroneous production before moving on to the next word. This remained true 6 weeks post-treatment. So, the number of reapproaches gradually diminished over time, although this cannot be attributed confidently to the treatment because insufficient baseline data were collected.

Figure 27-4 shows a decrease in N.K.'s rate of speech, below the baseline range, from the fourth through the sixth treatment sessions. After the 8-week treatment hiatus, N.K.'s speaking rate returned to the general range of initial baseline measures. When treatment was resumed, his speaking rate again decreased and remained generally in the range of 40 to 55 syllables per minute. At the follow-up session, N.K.'s rate of speech was 59 syllables per minute, still below initial baseline measures but approaching the range of the second set of baselines that were obtained after the 8-week treatment hiatus.

Figure 27-5 shows the efficiency index of N.K.'s speech as measured by content units per minute. It is clear that no stable baseline trend was established, nor is there the slightest evidence of any treatment effect. It is

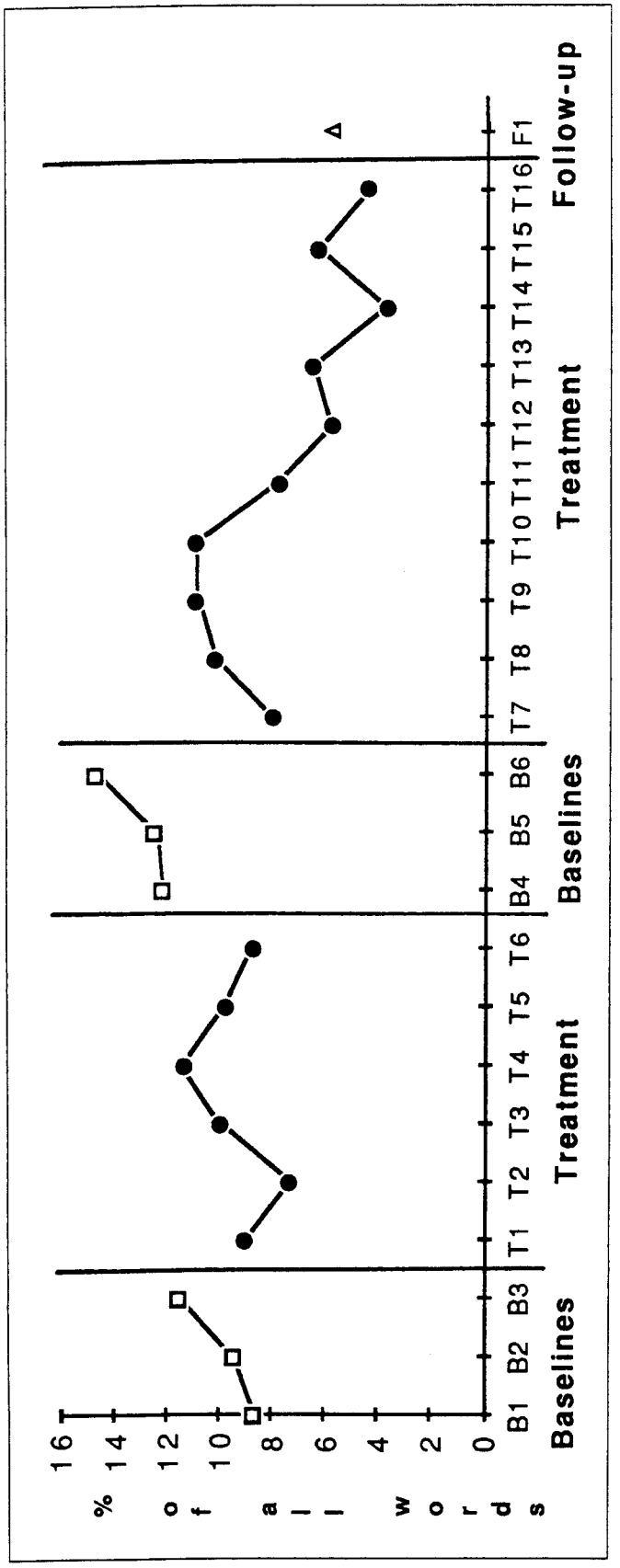

Figure 27-2. The percentage of total words that were produced as phonemic paraphasias by N.K. during descriptions of the Cookie Theft picture (Goodglass and Kaplan, 1983) in baseline, treatment, and follow-up probes.

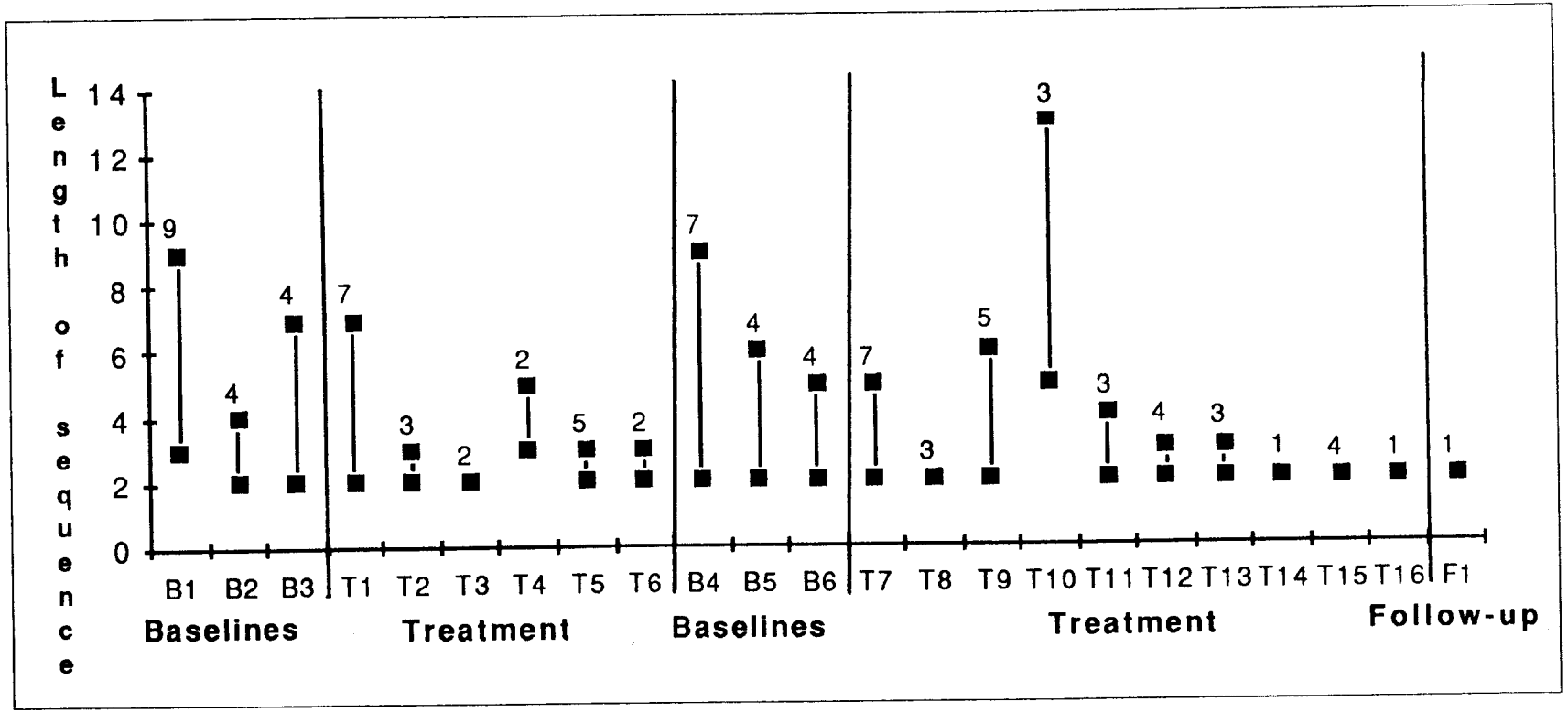

Figure 27-3. The number of phonemic reapproach sequences and the range of sequence lengths produced during baseline, treatment, and follow-up probes. The vertical lines indicate the range of sequence lengths; the numbers on top of the vertical lines indicate the number of sequences that occurred during each probe. For example, during the third baseline session (B3), N.K. produced four reapproach sequences, which ranged in length from two to seven productions.

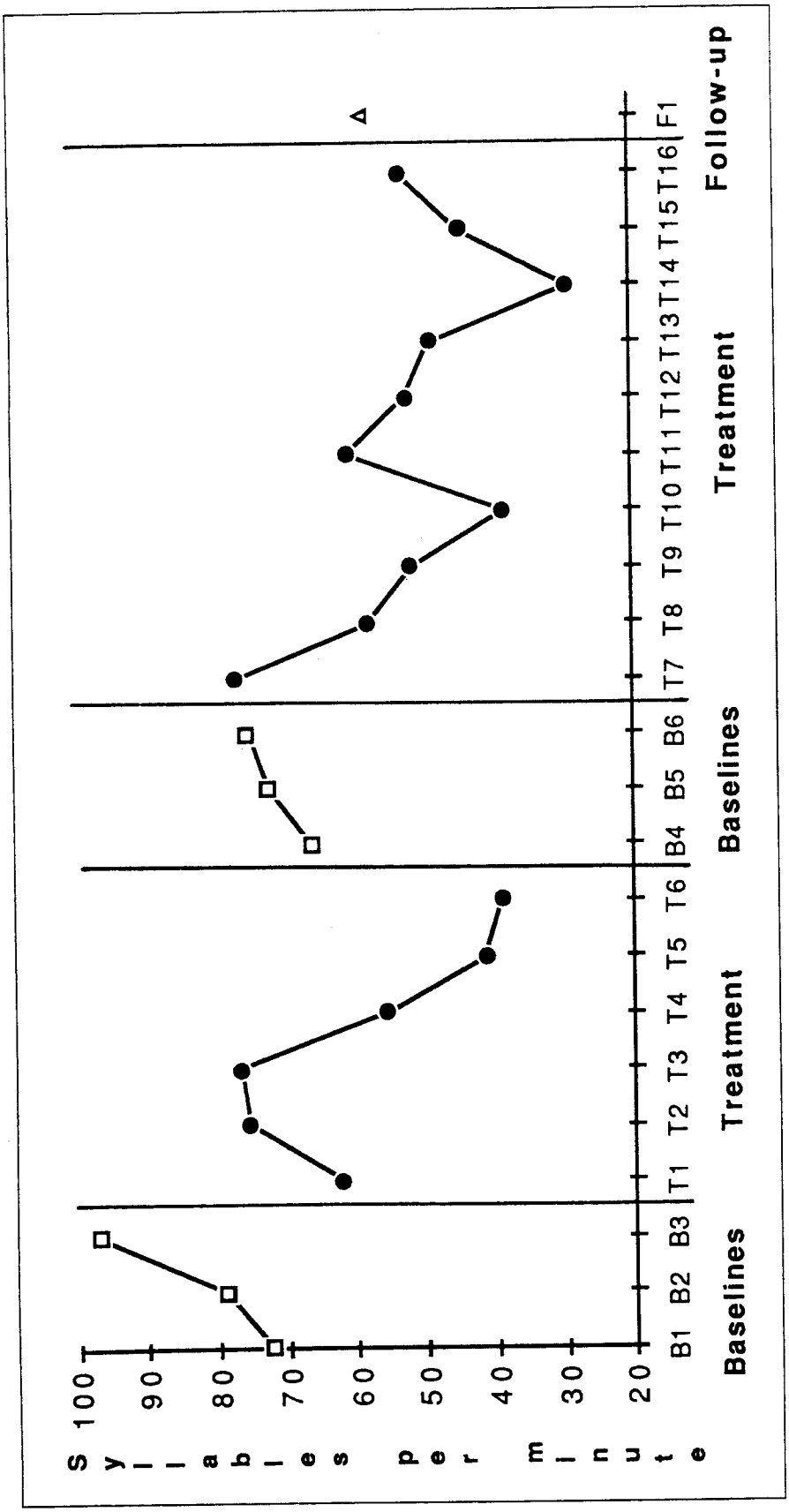

Figure 27-4. The rate of N.K.'s speech, in syllables per minute, during baseline, treatment, and follow-up probes.

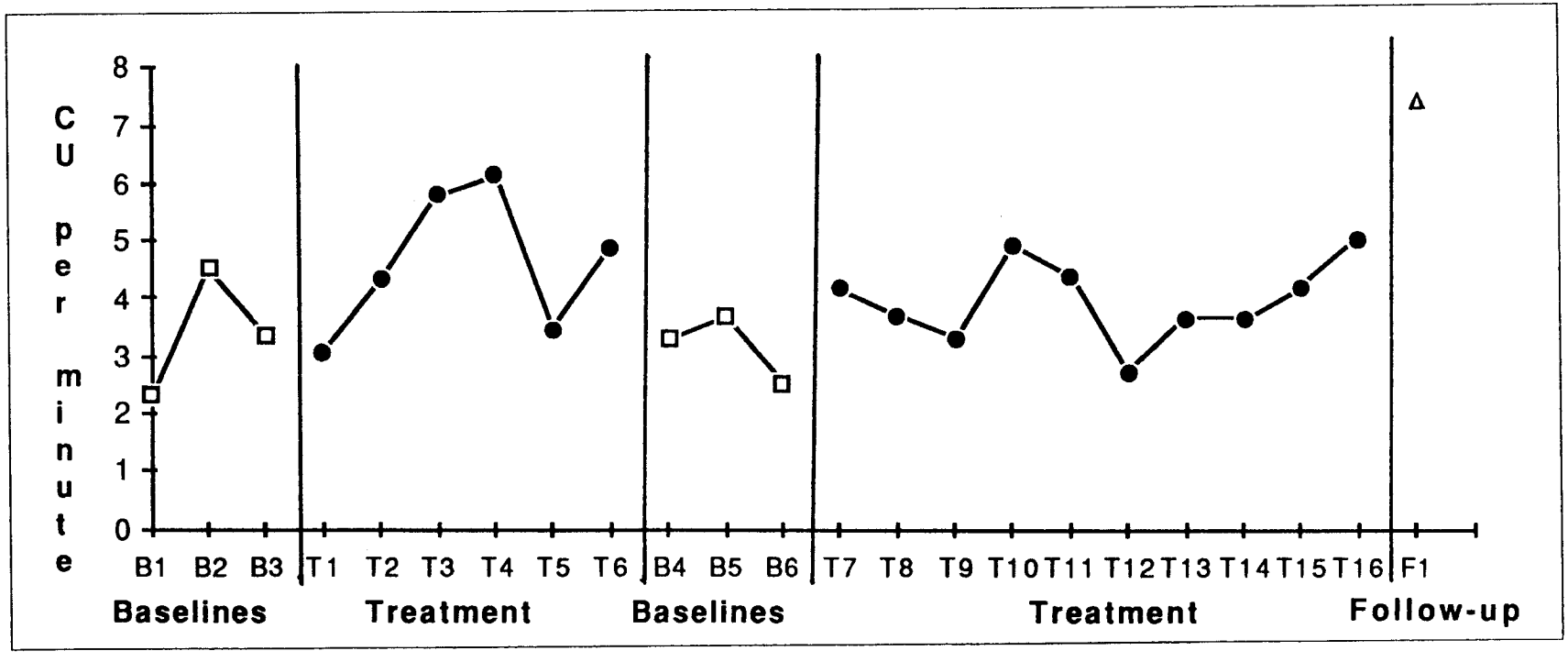

Figure 27-5. The efficiency index of N.K.'s speech, as measured by content units per minute (Yorkston and Beukelman, 1980), during baseline, treatment, and follow-up probes.

interesting to note the leap in the number of content units seen at follow-up (to 7.44 content units/min). Perhaps once N.K. no longer had to pay such close attention to speech-sound production, he was better able to attend to content. In any case, based on these data, it is difficult to ascribe the improvement on this measure at follow-up to the effects of the treatment program.

DISCUSSION

The results of this study indicate that the treatment program of oral reading tasks resulted in fewer phonemic paraphasias and a slower rate of speech for N.K. He also demonstrated shorter sequences of phonemic reapproaches during the last five treatment sessions, although insufficient baseline data make it impossible to attribute this result to the treatment program. The fact that N.K.'s connected speech improved during a treatment program focused on oral reading provides support for recommendations by others to use more intact modes to facilitate less functional modes. This can be an effective approach to treatment for some patients. Follow-up measures show that N.K. maintain these improvements at least for 6 weeks after treatment was terminated.

The treatment program was not effective at improving N.K.'s speaking efficiency, as measured by content units per minute. This is not altogether surprising. The focus of treatment was on sound production, not on semantic content. It had been hypothesized that this variable might improve because reducing the number of phonemic paraphasias and the number of phonemic reapproaches per paraphasia could allow N.K. to say a larger number of accurately produced content units. This did not occur during treatment. In retrospect, this variable may be viewed as a sort of multiple-baseline-across-behavior control. Lack of improvement in this area shows that the treatment effect generalized across modalities (i.e., from improved speech-sound production in the modality of oral reading to improved speech-sound production in the modality of connected speech) but not across linguistic tasks (i.e., there was no generalization from speech-sound production to semantic content of speech).

Obviously, the results obtained in this study are preliminary. Additional investigations of this treatment approach should include additional follow-up measures and samples of conversational speech. Finally, as with all single-subject designs, replications of this treatment program with additional subjects are necessary to ascertain its worth for other patients.

REFERENCES

Goodglass, H., and Kaplan, E. (1983). *The assessment of aphasia and related disorders.* Philadelphia: Lea & Febiger.

Joanette, Y., Keller, E., and Lecours, A. R. (1980). Sequences of phonemic approximations in aphasia. *Brain and Language, 11,* 30–44.

LaPointe, L. (1978). Aphasia therapy: Some principles and strategies for treatment. In D. Johns (Ed.), *Clinical management of neurogenic communicative disorders.* Boston: Little, Brown.

Luria, A. R. (1970). *Traumatic aphasia: Its syndromes, psychology and treatment.* Paris: Mouton.

McReynolds, L. V., and Kearns, K. P. (1983). *Single-subject experimental designs in communicative disorders.* Austin, TX: Pro-Ed.

Nespoulos, J. L., Joanette, Y., Ska, B., Caplan, D., and Lecours, A. R. (1987). Production deficits in Broca's and conduction aphasia: Repetition versus reading. In E. Keller and M. Gopnik (Eds.), *Motor and sensory processes of language.* Hillsdale, NJ: Erlbaum.

Rosenbek, J. C. (1976). Treatment of apraxia of speech: Prevention, facilitation, and reorganization. Mini-seminar presented to annual meeting American Speech-Language-Hearing Association, Houston, Texas.

Yorkston, K., and Beukelman, D. (1980). An analysis of connected speech samples of aphasic and normal speakers. *Journal of Speech and Hearing Disorders, 45,* 27–36.

DISCUSSION

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

Q. Well, I'm interested in your last result about the content. Does it say that Pierre Marie was right and that even though they can talk they have nothing to say? Or, once they can talk, they still can't say anything?

A. No. I think that maybe the measure of content units per minute might not have been the best measure to use in this case. In Yorkston and Beukelman's use, there are specific items that the patient has to produce to receive credit, based on norms obtained with the Cookie Theft picture. Perhaps if I had used an efficiency measure like that presented by Nicholas and Brookshire in their study, I would have seen an improvement in efficiency of speech. I think it was basically a function of the measure that I chose to use.

Q. As you know, we did a study similar to this with two patients, who also had parietal-temporal lesions, and in fact we did, with our effi-

that there are better measures that I could have used that perhaps would have shown that. Does that answer your question sufficiently?

C. Oh, gosh, yes. I guess one of the things that we all have to consider is that sometimes one person's efficiency is another person's inefficiency, and indeed, what may look very good for normal speakers may be bad for aphasic speakers. And sometimes I think we blame our treatment because we don't get a change in the predicted direction. If we thought about the prediction, we might see that, indeed, the patient, even though he didn't do what we wanted him to, was doing what he should for his system.

A. Yeah, I agree with that.

C. I think this may go along an earlier comment. One of the things we wished we would have done is to have some observers listen to tapes and do some subjective ratings, because we played them, just informally, for our staff, and everyone said, "Oh, yes, this man sounds so much better." But our measures really weren't stable, and they weren't showing that, but there was something else going on there, and maybe it wasn't the stuff we were measuring. We don't know what it was.

A. Yeah, I agree. In fact, that was suggested to me as something I could use. I would really like to get more data, more follow-up measures to play to listeners. And I'd like to play it not only to speech-language pathologists but to naive listeners as well, to see how they rate the improvement. But I think that it's a really good idea.

Q. I think this is about the same thing that others were talking about. Remind me now, you were treating phonemic paraphasias, you got a reduction, and you really had no control over the efficiency in terms of content units.

A. Right.

Q. When you withdrew, you had one data point where efficiency jumped way up.

A. Right.

Q. Did you get any extended follow-up on that?

A. No. That's something that I need to do. I had an appointment to do a second follow-up measure with him about 2 weeks ago, and he was ill, and we couldn't reschedule it. That seems to be what happens with me all the time when I try to do research studies. They never come out nice and clean the way the rest of yours do. So, I should really have more follow-up measures, and I think that's a real flaw in this. I don't know what would happen, and it would be really interesting to see what happened with those content units.

C. But you weren't all that surprised because, sometimes, a treatment that will improve one behavior may destroy another, and the way to improve that other behavior — the most efficacious treatment — might be to stop treating.

A. And I think that may be exactly what was happening. I was forcing him really to concentrate on speech sound production, really to focus on that a lot, and it took a lot of concentration for him. He was tired after these treatment sessions. And I think that maybe after he got 6 weeks away from me, he was able to step back from all of that and speak more normally, in terms of looking at more than just one aspect of his speech production. So I think that's a very good point.