21. An Alternating Treatments Comparison of Loose Training and a Convergent Treatment Strategy

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Clinical aphasiologists have objected to the use of convergent treatment (CT) tasks, such as producing automatic language or completing high-probability sentences, as the sole or primary means of facilitating language improvement in aphasia (Chapey, 1981, 1986; Davis & Wilcox, 1981). Yet these types of tasks are commonly used and advocated even though they do not allow subjects to communicate in a flexible, creative manner. Moreover, overreliance on highly structured training tasks alone may inhibit generalization (Baer, 1981; Stokes & Baer, 1977). Limited amounts of generalization have, in fact, been reported in aphasia treatment studies that have employed highly structured treatment regimens (Doyle, Goldstein, & Bourgeois, 1987; Kearns & Salmon, 1984; Thompson & McReynolds, 1986).

By contrast divergent tasks, such as loose training, emphasize variety, quantity, relevance, and production of logical alternatives (Chapey, 1981, 1986). Loose training has shown promise as a means of facilitating generalized improvements in language and communication in aphasia (Doyle, Goldstein, Bourgeois, & Nakles, 1989; Gaddie, Kearns, & Yedor, 1991; Kearns, 1985, 1986a, 1986b; Kearns & Potechin-Scher, 1989; Thompson & Byrne, 1984).

Despite the encouraging results of loose training studies, there have been no published comparisons of loose training approaches with other forms of intervention. In fact, with the notable exceptions of Loverso, Prescott, Selinger, and Riley (1989) and Thompson and McReynolds (1986), there are few comparisons of aphasia treatments. Needless to say,

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treatment comparisons are necessary to establish the relative effectiveness of our interventions.

PURPOSE

The purpose of this study was to compare a form of loose training, response elaboration training (RET), to a CT approach. The goal of both treatments was to facilitate an increase in the mean number and variety of content words produced per response and to facilitate generalized response. Specifically, the questions were as follows:

1. What is the relative effectiveness of RET and CT for increasing the amount and variety of content words produced by Broca's subjects?
2. Will treatment effects be maintained during 1-month follow-up probes of performance on training and generalization stimuli?
3. Will increased informational content generalize to (a) other persons (standard probes), (b) untrained picture stimuli, and (c) elicited speech samples (famous people; conversations)?

The primary dependent variable was the mean number of content words produced during probes administered throughout the study. In addition, at four points during the study (final baseline session, criterion probes for each training set, and maintenance probe), a measure of novel content was calculated. Each of the four probes was compared to the previous probe to determine if additional content words were produced that had not previously been produced in response to the same item. Data reported as "novel content" words reflect the variety of responses elicited during sequential probes obtained from each phase of the study.

Subjects

Two female subjects who had suffered a left-hemispheric cerebrovascular accident (CVA) with residual Broca's aphasia participated in the study. The subjects were right handed and native speakers of English with an eighth-grade level of education. E. P. was 70 years old and 7 months post-onset of aphasia at the beginning of the study. She achieved an Aphasia Quotient of 65 on the *Western Aphasia Battery* (*WAB*) (Kertesz, 1982), a score of 12 on the *Boston Naming Test* (Kaplan, Goodglass, & Weintraub, 1983), and a score of 124 on the *Token Test* (Spreen & Benton, 1969). N. S. was 61 years old and 37 months post-onset of her CVA. She achieved an Aphasia

Quotient of 61 on the *WAB,* 13 on the *Boston Naming Test,* and 110 on the *Token Test.*

METHODS

Experimental Design

A multiple-baseline design across behaviors and subjects was combined with an alternating treatments design (ATD) to compare the effectiveness and generality of RET and convergent treatments (Barlow & Hayes, 1979; McReynolds & Kearns, 1983). For within-subject control, a multiple baseline across behaviors was implemented by sequentially treating separate sets of experimental stimuli. The multiple baseline across subjects was implemented by staggering the initiation of treatment across patients, as a means of additional experimental control. Finally, the alternating treatments component was incorporated into treatment phases for each subject. That is, each subject received both RET and CT simultaneously.

Materials. Thirty black-and-white line drawings containing minimal specified context were used during baseline, ATD treatment, and all probe sessions. These pictures were equally divided into six sets of stimuli containing five pictures each. Four sets were used as training stimuli and two were used to probe generalization. Two of the four treatment sets were used with each type of treatment (RET and CT) in accordance with the multiple-baseline format.

Treatment stimuli depicted transitive verbs in categories of domestic activities, personal hygiene, sports, and recreation. Generalization sets contained untrained exemplars from these same categories.

In the RET condition a single action picture was presented during each experimental trial. Subjects in the CT condition also began treatment with presentation of a single action picture. However, separate line drawings were then provided for all other content words (nouns, adjectives, etc.) for the clinician-selected sentences targeted for production in this condition.

Generalization. Generalization was periodically probed to untrained stimuli, clinicians, and elicited speech throughout the study. The elicited speech probes involved having subjects describe famous people and events and respond to open-ended biographical questions. Four-week maintenance probes were obtained for all conditions.

Experimental Conditions

Baseline. There were two primary experimental phases, baseline and the alternating treatments phase. During the baseline phase, responses to the 30 verb picture stimuli were probed during separate baseline sessions conducted prior to intervention. The line drawings were randomly presented and subjects were asked to describe each picture. No response-contingent feedback or reinforcement was provided during the baseline condition. A minimum of five baseline probes were obtained for each subject prior to initiating the treatment phase. Probes were also obtained for each generalization condition.

Alternating Treatments. Treatment was conducted 3 to 4 days weekly and RET and CT were administered twice each day. Rest periods were provided between administration of the treatments. The order in which treatments were presented was randomly determined. The emphasis in both treatments was on facilitating an increase in the amount and variety of content words produced, and the treatment procedures were as similar as possible. That is, intervention techniques including shaping, chaining, and modeling were used to elicit longer utterances. Relatedly, the same number of training trials were provided for both RET and CT. Finally, identical probe procedures were used for both RET and CT and the criterion for termination of treatment was also identical (i.e., the mean of five content words per response). The two treatments are outlined below:

Response elaboration training. RET was developed to increase the length and information content of verbal responses of nonfluent aphasic patients (Gaddie et al., 1991; Kearns, 1985, 1990; Kearns & Potechin-Scher, 1989). The emphasis in RET is on shaping and chaining spontaneous, patient-initiated responses. RET stimuli serve primarily as a catalyst for clinician-patient interactions around an action concept. Line drawings are presented to help patients "get started" but, given the noncontextual nature of the stimuli, they must subsequently generate increasingly elaborate descriptions with minimal assistance from context and with minimal input from the clinician.

The primary sequence for a given treatment trial entails (a) eliciting spontaneous responses to minimally contextual picture stimuli, (b) modeling and reinforcing initial responses, (c) providing "wh" cues to prompt subjects to elaborate on their initial responses, (d) reinforcing attempted elaborations and then modeling sentences that combine initial and all subsequent responses to a given stimulus picture, (e) providing a second model of sentences that combines previous responses and then requesting a repetition of the sentence, and (f) reinforcing repetitions of combined sentences and providing a final model of the sentence. Throughout this sequence naturalistic feedback is provided during the structured interactions.

Convergent treatment. In contrast to RET, the emphasis in CT is on tasks that require subject responses that converge on a single "correct" response. In this study, lexical items and target sentences were preselected by the clinician and picture stimuli corresponding to each lexical item were provided. Another distinguishing characteristic of CT as compared to RET was that both graphic and verbal "wh" cues were provided in CT. The sequence of procedures for a given trial entails (a) eliciting a description of "subject" and "verb" picture stimuli, (b) modeling and reinforcing the initial response, (c) providing an additional picture that depicts another lexical item in the preselected sentence along with graphic and verbal "wh" cues, (d) reinforcing correct labeling of the new target picture or providing the target word for repetition, (e) providing a combined model of all previously presented lexical items and requesting a repetition, and (f) reinforcing repetition of combined sentences and providing a final model of the sentence.

RESULTS

Written transcripts of baseline and probe sessions were independently rescored by a second clinician to assess interobserver agreement. For E. P., point-to-point agreement for content words ranged from 91% to 96%, with a mean of 94%. Interobserver agreement for N. S. ranged from 97% to 100%, with a mean of 98% agreement.

Subject E. P.

Acquisition and maintenance data for E. P. are presented in Figure 21.1. The ordinate of this graph shows the mean number of content words produced in response to stimuli, and the number of probe sessions is presented along the abscissa. The relative effectiveness of RET and CT can be seen by examining performance on these probes of treated stimuli.

Data for the first sets of trained items are presented in the top graph. It can be seen that E. P.'s baseline response was relatively stable for both RET (open squares; $x = 2.6$) and CT (closed circles; $x = 1.8$) stimuli. During the alternating treatments phase there was a gradual increase in the number of content words produced on stimuli treated with both approaches. However, E. P. reached criterion (≥ 5) on RET-trained stimuli after 11 probe sessions (30 treatment sessions). She did not achieve crite-

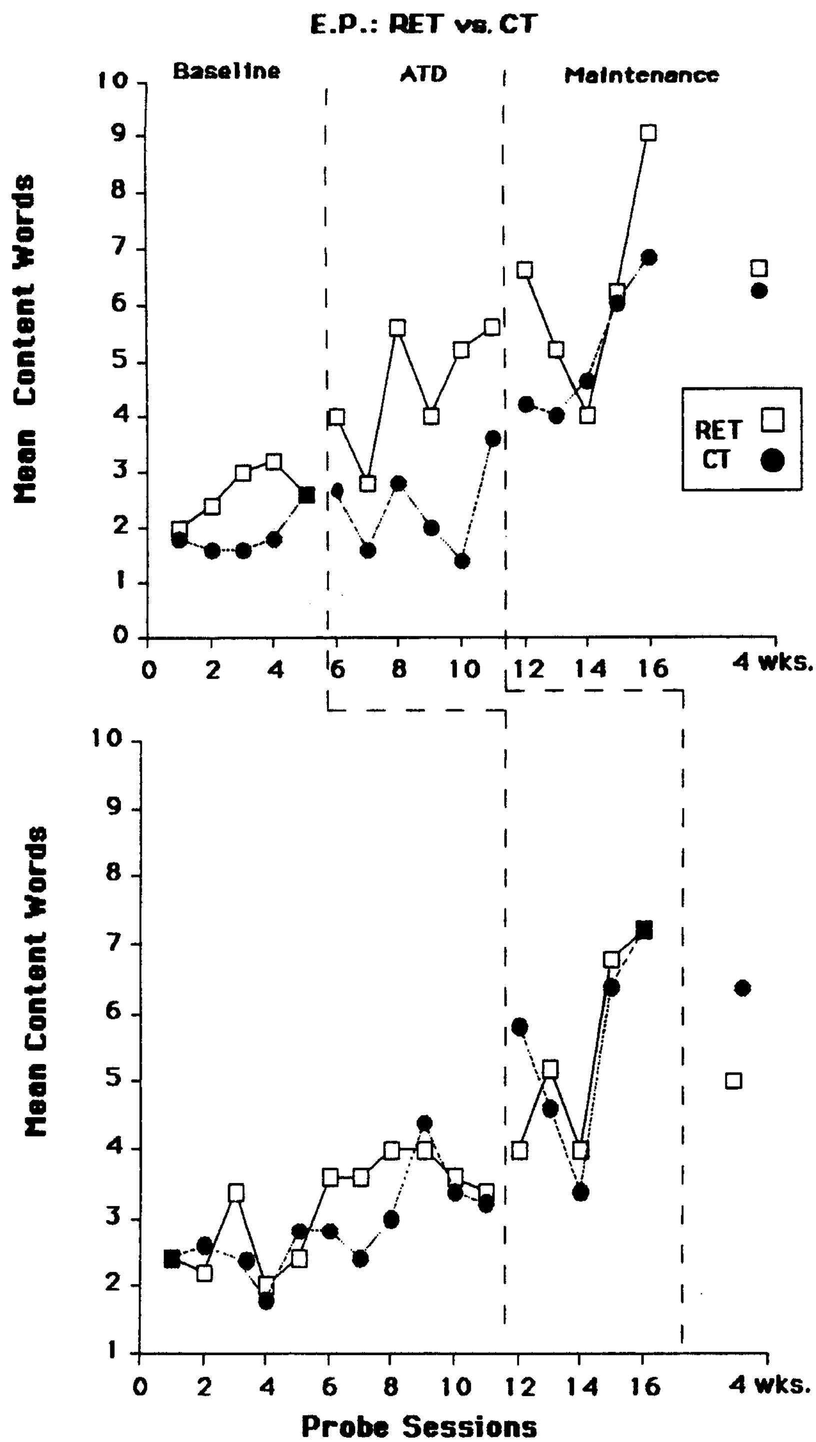

Figure 21.1. Mean number of content words produced by E. P. on response elaboration training (RET) probes (open squares) and convergent treatment (CT) probes (closed circles) during baseline, alternating treatments (ATD), and maintenance phases.

rion for the CT condition. Throughout this alternating treatments phase E. P. consistently produced a greater mean number of content words in response to RET items as compared to CT items.

The bottom half of the graph presents data for the remaining sets of training items. There was a relatively stable and approximately equal rate of baseline response to both RET and CT stimuli. These data show relatively good experimental control. Although not shown in this graph, data from the extended baseline phase of the second subject also remained stable during the initial treatment phase for E. P.

During the alternating treatments condition for the second sets of RET and CT items (Figure 21.1, bottom), E. P. reached criterion for both treatments after an additional 5 probe sessions (i.e., after 25 treatment sessions). Thus, following the simultaneous treatments of the initial intervention phase, RET and CT were equally effective for facilitating an increase in the number of content words produced on probes of the second set of trained items.

Maintenance. Maintenance data for performance on the first sets of items trained are shown at the right side of the top graph in the figure. The trend toward a higher level of response to RET-trained items continued during this phase. Maintenance data were also collected at 4 weeks after completion of the treatment for all stimulus items. These data are presented at the far right of the graphs in Figure 21.1 (i.e., 4 wks.; abscissa). Criterion-level performance ($x > 5$ content words) was maintained for RET and CT items for both the first and second sets of training items (top and bottom graph, respectively).

Generalization Across Clinicians. Although not shown in Figure 21.1, the data for generalization across clinicians closely parallel the acquisition data described above. For example, the mean number of content words for RET stimuli increased from 1.7 at baseline to 4.7 when criterion was met for the last training set. Similarly, for CT items the mean number of content words increased from 1.3 to 3.1 from the initial baseline to completion of intervention. Thus, performance on probes administered by a clinician not involved in training elicited approximately the same level of performance as those administered by the treatment clinician. As was true for the acquisition data, there was a greater increase in the mean number of content words produced on RET stimuli as compared to CT stimuli on the probes administered by the second clinician.

Generalization Across Stimuli. The results of probes to untrained exemplars of stimuli are presented in Figure 21.2. Again, these results paralleled the treatment data presented in Figure 21.1. Generalization from trained to untrained stimuli occurred for both RET and CT exemplars.

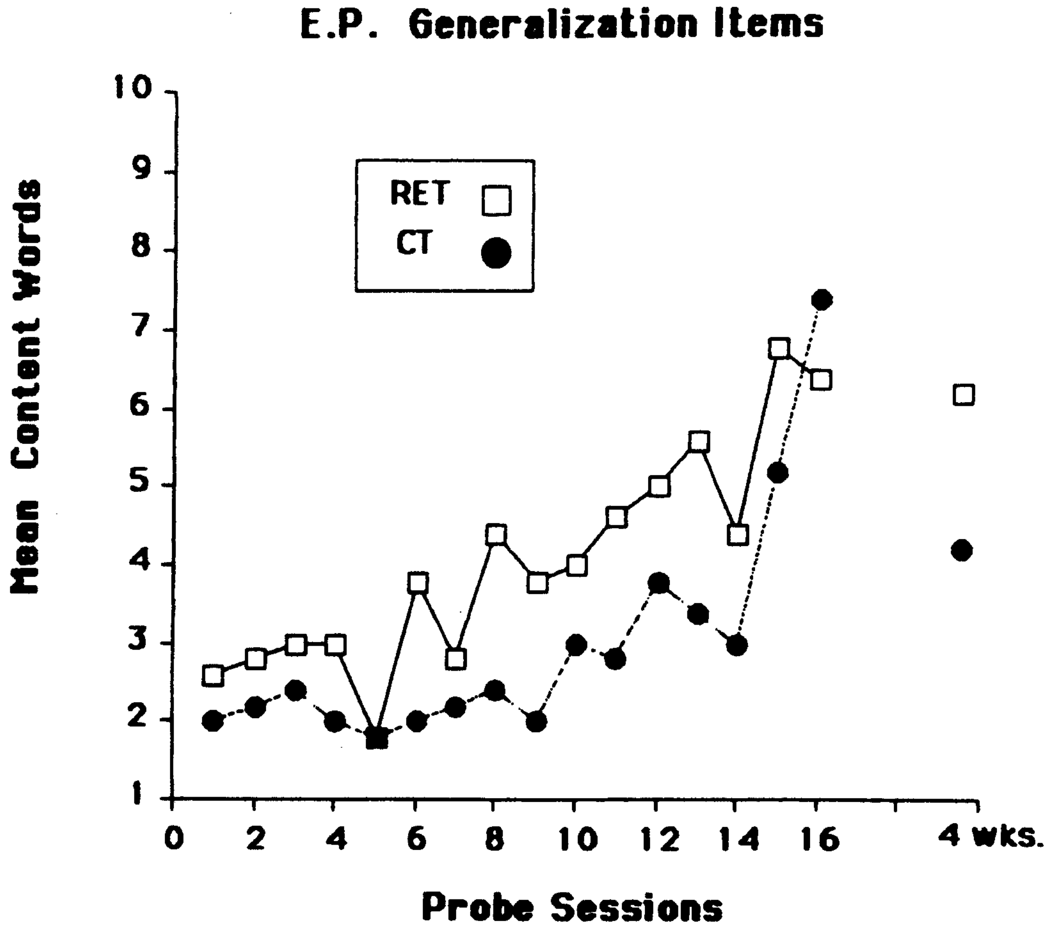

Figure 21.2. Mean number of content words produced by E. P. on probes of untrained exemplars of response elaboration training (RET) stimuli (open squares) and convergent treatment (CT) stimuli (closed circles).

Moreover, there was a greater degree of carryover to RET items, particularly during training for the initial sets of stimuli (i.e., probe sessions 6 to 11). Importantly, this greater degree of across-stimuli generalization for RET items was also evident on the 4-week maintenance probe (Figure 21.2, far right).

Novel Content. Figure 21.3 presents our analysis of novel-content words produced over time. Some increase in variety is expected as the amount of content increases. Therefore, the data of primary interest are the relative numbers of novel-content words produced on probes of RET and CT stimuli for the between-phase comparisons shown in the figure: baseline versus criterion for the first training set (baseline - Tx1), criterion for the first training set versus the second training set (Tx1 - Tx2), and criterion

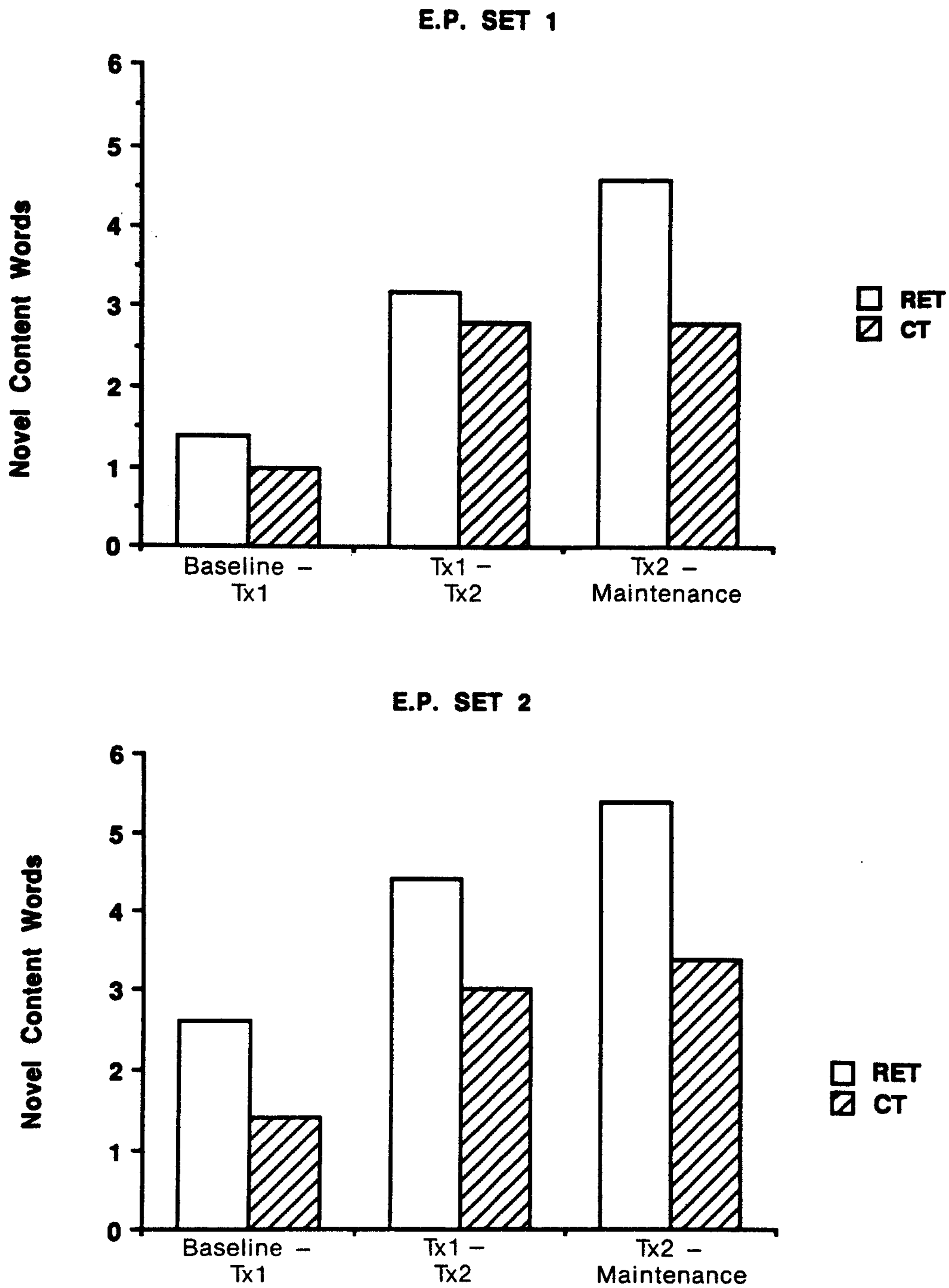

Figure 21.3. Between-phase differences in the number of novel content words produced by E. P. on probes obtained across consecutive phases of the study for response elaboration training (RET) stimuli (open bars) and convergent treatment (CT) stimuli (filled bars).

for the second training set versus the 4-week maintenance probe (Tx2 - maintenance). Examination of the graph shows that there was an increasing gap in the number of novel content words produced during the treatment phases. There was relatively greater response variety in the RET condition.

The value of examining novel content is apparent when comparing the relative performance on RET and CT items over time, particularly when viewed in conjunction with the previously described acquisition and maintenance data. Even when the mean number of content words produced was essentially equivalent for RET and CT during the acquisition phase for the second training set (Figure 21.1, bottom, probe sessions 12–16), novel content was increased for the RET items (Figure 21.3, Tx1 - Tx2). Relatedly, an examination of performance on the 4-week follow-up probe revealed increases in novel content only for RET items (Figure 21.3, Tx2 - maintenance), despite the fact that performance on both RET and CT items was maintained at or above criterion level (Figure 21.1, far right).

Elicited Speech Samples. Data from probes of two elicited speech samples are shown in Figure 21.4. The data marked "Converse" (open bars) in Figure 21.4 were obtained by having an experimenter ask questions relating to occupation, activities of daily living, and family. There was an increase in the mean number of content words produced from three words per utterance during baseline to approximately eight content words per response at the completion of training (Set 2 Tx).

During the second conversational probe the subject was asked to describe and discuss photographs of famous people and events (e.g., Hindenburg or Kennedy). There was a slight increase in the number of content words produced over time in this condition.

Subject N. S.

Treatment data for N. S. are presented in Figure 21.5. Although not shown in the figure, the baseline data in the top panel for N. S. were obtained while the first subject (E. P.) was undergoing treatment for the first set of training items (see Figure 21.1). The lack of drift for N. S. during baseline (Figure 21.5, top left) helped to establish across-subject experimental control within the multiple-baseline format of the study.

Examination of the data in Figure 21.5 reveals a clear superiority for RET-trained stimuli for both sets of stimuli in terms of the mean number of content words produced. The mean baseline level of response was 1.45 and 1.31 content words for RET and CT items, respectively, for the first set of treatment items (Figure 21.5, top). Although N. S. reached criterion

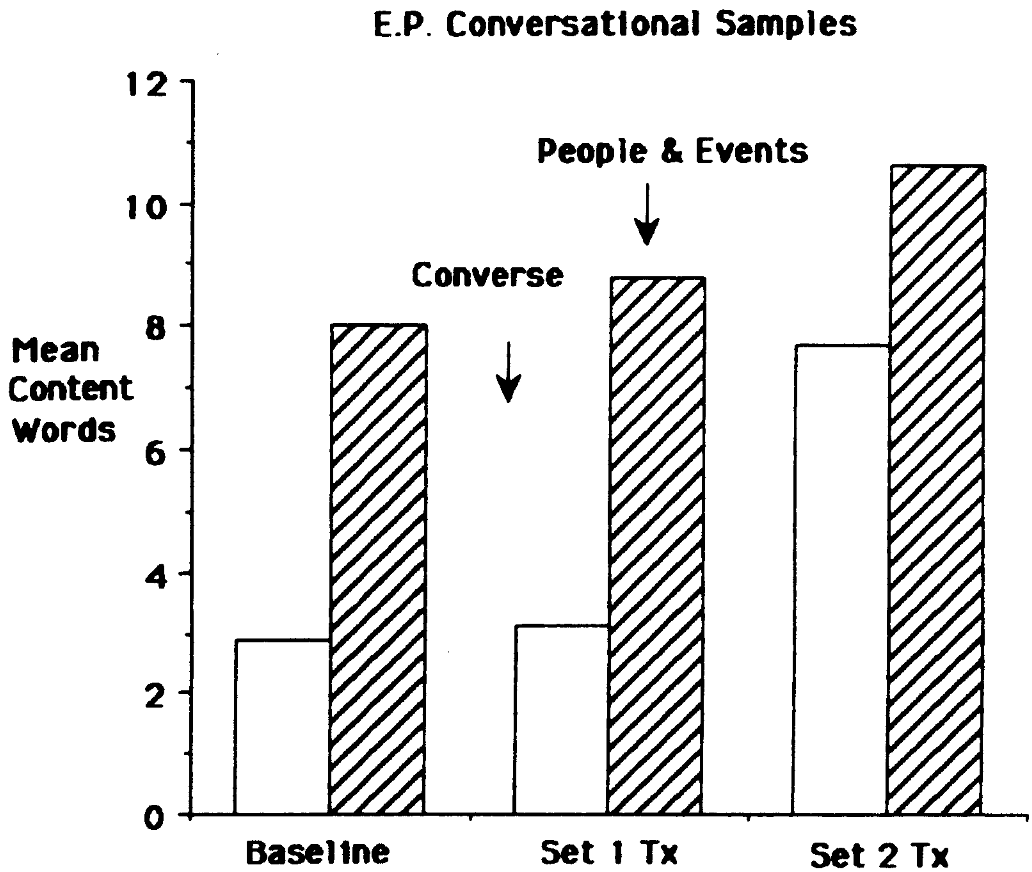

Figure 21.4. Mean number of content words produced by E. P. during two elicited speech conditions obtained during baseline, treatment for the first set of stimuli (Set 1 Tx), and at the completion of intervention (Set 2 Tx).

(≥ 5 content words) on RET items after 20 treatment sessions (probes 9 through 12), she never met criterion for CT items. The overall increase in the mean number of content words produced during the treatment phase was 6.75 for RET items and 1.9 for CT-trained items.

Examination of the data for the second set of items trained (Figure 21.5, bottom) reveals a similar pattern of response. That is, minimal improvement was evident for CT-trained items despite the fact that N. S. achieved the criterion level of response for RET items.

Maintenance. Maintenance data for performance on the first set of items trained are shown at the right side of the top graph in Figure 21.5. Gains for RET were retained at criterion levels. This finding replicates previous maintenance results obtained for subject E. P. (Figure 21.5, top right).

Maintenance data were also collected at 4 weeks after completion of the treatment for all stimulus items (Figure 21.5, far right). Although some

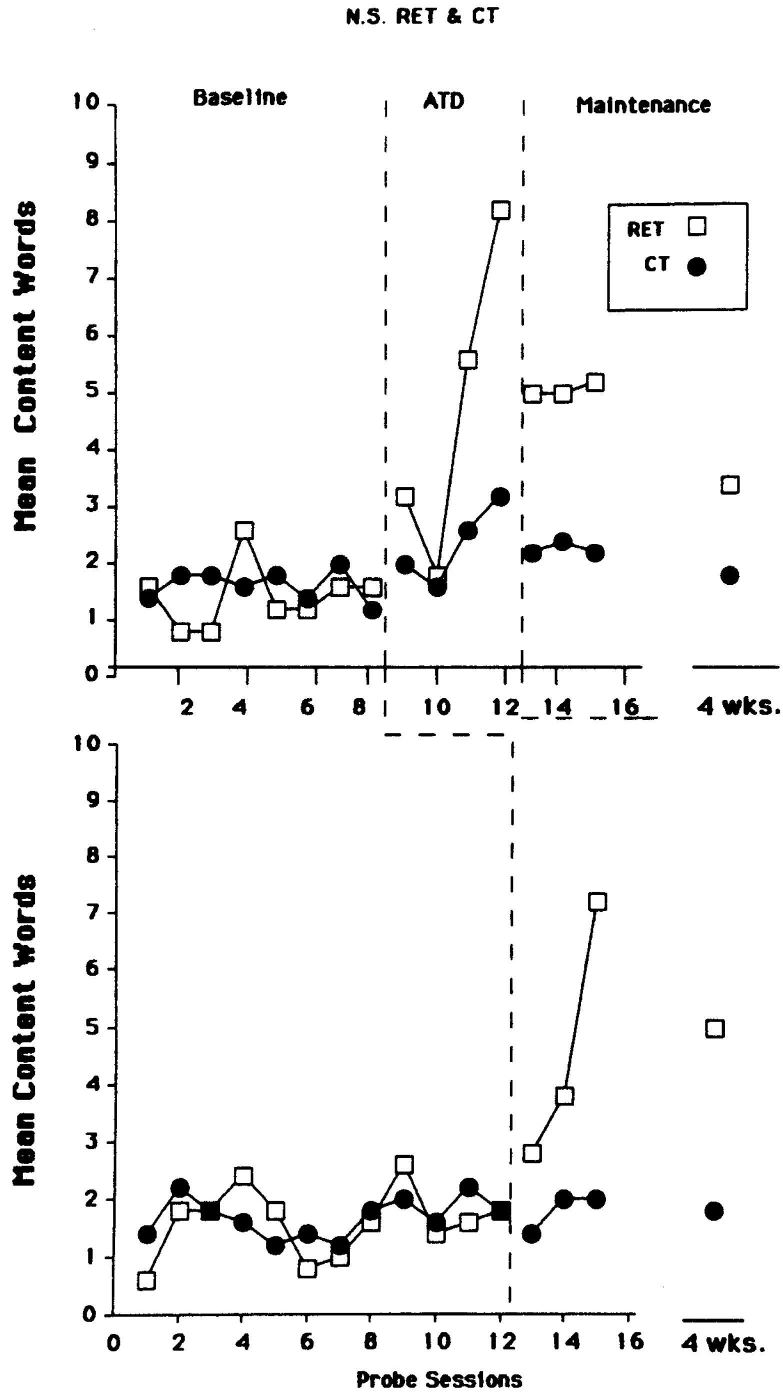

Figure 21.5. Mean number of content words produced by N. S. on response elaboration training (RET) probes (open squares) and convergent treatment (CT) probes (closed circles) during baseline, alternating treatments, and maintenance phases.

decrease in the number of content words produced on the maintenance probes was evident, performance was maintained at levels well above baseline for RET-trained items. Importantly, performance on RET items remained at criterion levels on the maintenance probe for the second set of items (Figure 21.5, bottom).

Generalization Across Clinicians. Performance on probes of both types of stimuli essentially paralleled performance with the training clinician. For RET items, there was a mean increase of 3.9 content words. As was true with the training clinician, N. S. showed minimal improvements on CT-trained items (0.7 content word) on across-clinician probes.

Generalization Across Stimuli and Elicited Speech. N. S. did not generalize to untrained stimuli and showed no significant change in mean content words produced during the elicited speech probes.

Novel Content. The relative change in novel content words for N. S. could not be analyzed due to the fact that she had negligible improvement in the CT condition. As a result, a comparison of novel content produced under the RET and CT conditions could not be undertaken.

SUMMARY

A primary purpose of this study was to examine the relative effectiveness of response elaboration training versus convergent treatment for increasing the amount and variety of content words produced by patients with Broca's aphasia. Across patients, RET facilitated a greater amount of content than CT for three of the four sets of training items. In fact, one subject (N. S.) never reached criterion for CT-trained items. For the remaining subject (E. P.), who did achieve criterion-level performance for both RET and CT items, criterion was obtained more quickly for the RET-trained items. Results of qualitative analysis of novel content also provide preliminary data that support the relative benefits of RET in encouraging response variety. That is, for the one subject in whom novel-content analyses could be completed, there was a relatively greater increase in the number of novel-content words produced over time for RET as compared to CT items. Thus, the preliminary data from this study indicate that, for some patients, loose training approaches such as RET may be more effective than some CT approaches in increasing amount and variety of verbal informational content.

The maintenance of treatment effects was examined at 4 weeks after the conclusion of training. For the subject who achieved criterion for both

RET- and CT-trained items, maintenance was relatively equivalent and response was maintained at or above criterion level for both types of treatment. Treatment effects were maintained at criterion level for one set of training items and above baseline level for the second set for the subject who only improved on RET-trained items (N. S.).

The results of generalization testing were strong for one subject, but limited for the other. Whereas E. P. exhibited generalization to untrained stimuli, people, and conversational speech, N. S. only generalized on probes administered by a clinician who was not involved in training. Generalization did not occur across stimuli and speaking conditions for N. S.

Overall, the results of this study replicate previous findings (Doyle et al., 1989; Kearns, 1985, 1986a; Kearns & Potechin-Scher, 1989; Thompson & Byrne, 1984) that loose training procedures such as RET facilitate a generalized increase in the amount and variety of content produced for some aphasic subjects. In addition, for one subject generalization effects associated with loose training/RET were greater than with convergent therapy. Additional replications are under way to evaluate the reliability of these findings.

An interesting finding from this study was the differences that were apparent in two reasonably matched Broca's subjects. Obvious, but probably inadequate, explanations for these differences may be found in the time post-onset of aphasia for the subjects (7 vs. 37 months) and the fact that the subject who generalized more (E. P.) was trained at home rather than in the clinic. It should be pointed out, however, that both subjects had plateaued prior to intervention and both received identical forms of treatment.

At the risk of entering the cognitive cloud (Davis, 1989), the explanation may lie, in part, in the "cognitive styles" of the subjects themselves. It seems that subjects such as E. P., who initially produce a reasonable amount and variety of informational content, may generalize more than subjects such as N. S., who produce an equal amount of content with less variety. We are currently examining the predictive power of these observations and are attempting to determine if targeting response variety and flexibility as a goal of intervention is more powerful than providing an opportunity for flexible response.

In conclusion, continued inclusion of both loose training and convergent treatment approaches in our clinical practice is warranted. However, additional research is needed to refine these generic intervention strategies and to explore the unique advantages and limitations of each approach. The data from the present study also support the need for additional comparisons of language intervention approaches for aphasia. However, it is not too early to conclude that, in the words of Ricky Ricardo, "I Love Loosely."

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