Published in final edited form as:

Aphasiology. 2009 December 12; 23(12): 1383–1397. doi:10.1080/02687030802235203.

TRAINING VERB PRODUCTION IN COMMUNICATIVE CONTEXT: EVIDENCE FROM A PERSON WITH CHRONIC NON-FLUENT APHASIA

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Abstract

Background—The use of constraint-induced treatment in aphasia therapy has yielded promising but mixed results.

Aims—We conducted a treatment study with an individual with chronic non-fluent aphasia. The goal of the treatment was to improve verb production in sentence- and narrative- contexts.

Methods & Procedures—We administered a modified constraint-induced aphasia treatment in a single-subject design. Treatment emphasized the production of verbs within informative exchanges. Verb production in narratives was assessed before and after the treatment.

Outcomes & Results—Results demonstrated a significant increase in the number of verbs produced during narrative generation following treatment. Moreover, a positive change was perceived by naïve listeners who rated the social-communicative impact of the participant's narratives.

Conclusions—The increase in verb production seen in the post-treatment measures is attributed to a combination of the constraints imposed on sentence production during the treatment sessions, the informative nature of the treatment exchanges, and the relative intensity of the treatment schedule.

Keywords

aphasia; non-fluent; chronic; constraint-induced; verb; informative; narrative; social-communicative validity; generalization

Introduction

Constraint-induced (CI) learning has been developed to improve voluntary movement of the hemiparetic limbs in post-stroke individuals (Taub, Uswatte, & Pidikiti, 1999). Aphasiologists have begun to apply the CI principles to aphasia treatment (e.g., Barthel et al., 2007; Maher et al., 2006; Meinzer, Djundja, Barthel, Elbert, & Rockstroh, 2005; Meinzer, Elbert, Djundja, Taub, & Rockstroh, 2007; Meinzer, Streiftau, & Rockstroh, 2007; Pulvermüller et al., 2001). Constraint-induced aphasia treatment (CIAT) emphasizes several components of therapy: massed practice of the targeted communicative behavior (intensity); communication restricted to predominantly verbal output (constraint), graded task demands that systematically change as skills improve (shaping), and a therapeutic setting that is relevant to the treated individual

and to everyday communication (functionality). The studies cited above have applied the CIAT principles in a group study design and found that groups who received CIAT improved their language and communication skills. Improvement has been demonstrated by comparing pre- and post-treatment measures, including standardized tests (e.g., the Aachen Aphasia Test [Huber et al., 1983], the Western Aphasia Battery [Kertesz, 1982]) and measures of functional communication (e.g., the Communication Activity Log [Pulvermüller et al., 2001], The Communicative Effectiveness Index [Lomas et al., 1989]).

In the present study, we explored the potential impact of two components of CIAT: (1) Targeting verb production (2) Performing therapy exclusively in the context of informative exchanges, defined as verbal interactions in which each speaker does not know what the other is going to say, thus resembling typical conversational interaction (e.g., Doyle et al., 1996; Nicholas & Brookshire, 1993). An additional goal of this study was to develop and use a measure of the social-communicative impact of CIAT. There has long been an interest in functional communication outcomes of aphasia treatment (e.g., Doyle, Tsironas, Goda, & Kalinyak, 1996; Hopper, Holland, & Rewego, 2002; Meinzer, Streiftau, & Rockstroh, 2007; Pulvermüller et al., 2001; Ross & Wertz, 1999). Several questionnaires have been developed to assess functional communication, typically as judged by caregivers (e.g., Frattali, Thompson, Holland et al., 1995; Glueckauf, Blonder, Ecklund-Johnson et al., 2003; Lomas, et al., 1989). A few investigators have sought the judgment of naïve listeners (e.g., Jacobs, 2001; Lustig & Tompkins, 2002) but such measures have not been standardized and their results have been mixed. Given the importance of confirming that any language improvement found in post-treatment measures has a positive effect outside the clinic, we developed and collected preliminary data with a new measure of the social-communicative impact of language improvement.

In our investigation, we applied a single-subject design to CIAT. We administered aphasia treatment to an individual with chronic non-fluent aphasia with the aim of increasing his verb production in communicative contexts. Additionally, we explored whether naïve listeners perceive an improvement in communication following treatment.

Methods

Participant

The participant is a 60 year old male who suffered a left cerebrovascular accident twelve years prior to the current investigation. He reported having little-to-no speech output for many years after his stroke. He regained language functions slowly and has been attending both individual and group therapy for the past five years. The participant reported continual frustration due to his difficulties communicating and was highly motivated to improve his communication abilities. He lives at home with his wife and one of his children. English is the language spoken at home and the only language he speaks. Prior to the stroke, the participant worked in construction. He did not return to work following the stroke.

A structural MRI scan demonstrated extensive damage to the left Broca's area (pars triangularis and pars opercularis), the middle 1/3 of the periventricular white matter area, throughout most of Wernicke's area and a portion of the supramarginal gyrus. At the time of testing, his language abilities in informal settings were characterized by non-fluent speech output and good comprehension of instructions and conversation. His utterances were typically limited to single words (mostly nouns) and short phrases, with occasional clauses. He used many simple social responses and a variety of automatic phrases and frequently used gesture, writing and drawing to augment his verbal output.

Formal testing using the Boston Diagnostic Aphasia Exam (Goodglass, Kaplan, & Barresi, 2001), showed moderate difficulty naming objects, speech output containing phonemic and verbal paraphasias and a moderate auditory comprehension deficit. The participant repeated words and sentences, and produced melodies, rhythms and automatized sequences. He retained the ability to read and write single words, but had difficulty reading and writing longer and more complex material (See Table 2). He demonstrated right hemiplegia and mild oral-motor apraxia which did not significantly affect his intelligibility.

The participant wore a unilateral digital behind-the-ear hearing aid to compensate for a bilateral mild-to-moderate sloping sensorineural hearing loss. His hearing was judged to be good in a quiet environment.

Procedures

Treatment design—This investigation followed a time-locked A-B-A-B (treatment block 1 -- no treatment – treatment block 2 – no treatment) design. Each of the first three blocks lasted four weeks; the final no-treatment block (until follow-up) lasted 10 weeks. No individual therapy was provided during the no-treatment blocks. Throughout the investigation, the participant took part in two different, unrelated hour-long weekly conversation groups, which he has attended for the past four years. These groups discussed current events and personal issues using multimodal communication, but did not focus on structured language treatment activities. Internal Review Board (IRB) approval was granted for this study and Informed Consent was obtained from the participant and his wife.

Treatment principles and tasks—The experimental language intervention was designed to: (1) be relatively intense, (2) constrain the target output, (3) use informative exchanges, (4) focus on materials relevant to the participant, and (5) allow shaping of the task demands to match the participant's improving production abilities. The operational definitions of each of these principles are provided below. A summary of the tasks employed is presented in Table 1.

Intense: In this study, massed practice was obtained by means of frequent sessions (four times per week) and longer treatment sessions than are typical (75-minute sessions rather than more typical 30–60-minute sessions). Each treatment block consisted of twenty hours of therapy within four weeks (five hours per week spread over four days). We note that this level of treatment intensity is greater than the typical traditional treatment for individuals with chronic aphasia but less than has been used in prior CIAT studies.

Constrained: Communication during treatment was verbal only; use of writing, gesture and drawing were discouraged. This was accomplished in part by use of a barrier between interlocutors. The barrier also allows individuals with physical impairment partake in a card game without revealing their cards (see Pulvermüller et al., 2001). During most sessions the participant and the clinician sat on opposite sides of small table with a 12 X 16 inch barrier on the table obscuring their view of one another's face. The combination of the barrier and verbal reminders were sufficient to prevent the use of writing, gesture and drawing. Speech output was further constrained by requiring each verbal production to include a verb (see section on relevance below).

Informative: Constraint-induced physical therapy emphasizes functional everyday movements such as sweeping, lighting candles, folding, etc. We applied this concept to language by ensuring that all verbal communication was informative. The content of each verbal exchange was informative insofar as it added new information not known by the other interlocutor (Grice, 1975). This was accomplished in several ways. One task resembled “go

fish” card games in which each speaker does not know what card the other person has and therefore does not know what card the person will request. Another therapy task involved team story construction: the participant and the therapist together constructed a story about a single picture with each turn building thematically and logically on the last turn provided by the other speaker. Another task required the participant to construct scenarios about what might have happened before and after certain events; i.e., construct a novel story based on one piece of shared information or a context from a picture. See Table 1 for a description of the tasks.

Relevant: The content of the tasks and materials was geared to the participant’s interests. For instance, because he had worked in construction and continued to work on his own home, scenarios involving building activities were included in the tasks. The therapy was also relevant in that the goals were based on his request to be able to use more verbs in spoken communication. To this end, each turn was expected to contain a verb. If the participant did not include a verb, he was provided with scaffolding until he could produce a verb. For example, in a “go fish” game, if the participant did not produce a verb to request an action card, the clinician prompted him (e.g., “what is the person doing”). If he produced a verb, the clinician would respond to the request even if the sentence was not complete or grammatical, at least initially (see discussion of Scaled below).

Scaled: Throughout the treatment, the tasks were shaped to match the participant’s language production abilities (see Meinzer et al., 2007; Pulvermüller et al., 2001). To do this, tasks were made more complex as the participant improved. For example, in the action picture version of “go fish” the picture cards initially contained simple action pictures. The participant was required to ask for a card by saying any word, phrase or clause/sentence that contained a verb to identify a picture (e.g., *climb* or *climbing*). As his verbal production improved, he was required to ask in full sentences with an introductory phrase (“do you have *climb*?”), then with a more complex question (e.g., “do you have a picture of *the boy is climbing*?”). Later the cards contained two action pictures (e.g., *sweeping* and *running*), and progressed through the same stages, but using two verbs. Other tasks that required full sentences and developed narratives were introduced in the second treatment block after verb production in simple tasks was reliable (>90% accurate in task context). These included team story construction and scenario description (see above and Table 1). The requirements for these tasks progressed from simple S-V-O sentences to sentences containing adjectives, adverbs and prepositional phrases. At this later point in the therapy, he was generally successful in producing an appropriate verb, so the tasks were geared towards eliciting well-formed sentences containing verbs. If he produced a sentence fragment, he was asked to expand it to a full sentence, and if necessary a model was provided.

Each session included two or three tasks. The structured tasks (e.g., “go fish,” picture description) targeted an initial list of 37 verbs. Twelve were construction verbs (e.g., *hammering*, *painting*), ten were home verbs (e.g., *eating*, *washing*), ten were recreation verbs (e.g., *sailing*, *hiking*), and five were light verbs (*having*, *doing*). As the treatment progressed, 20 additional verbs were introduced (e.g., *hugging*, *throwing*). In the less-structured tasks (e.g., story generation), there were no specific target verbs. The verbs were selected on the basis of relevance to his life and communication needs, not on the basis of structural, semantic, or phonological attributes. Verbs were not elicited a specific number of times during treatment. Accordingly, no specific verbs were assessed in the pre- and post-treatment measurements. Unlike other treatment studies which train a specific group of words or structures, this study attempted to enhance verb production generally.

Pre-treatment and outcome measures—Pre-treatment measures were selected to establish type and severity of language and cognitive deficits/abilities, and to allow comparisons with normative data. These included the Boston Diagnostic Aphasia Exam

(BDAE 3rd Edition, Goodglass et al., 2001) and the Cognitive Linguistic Quick Test (CLQT, Helm-Estabrooks, 2001). These standardized measures were collected at two points: before the first treatment and following the second treatment block.

Two types of outcome measures were devised to assess the effects of therapy in social-communicative contexts: narrative construction and naïve listener ratings.

Narratives: The participant generated three personal narratives, one each on the topics of his (1) work, (2) family, and (3) a favorite vacation. These were selected because they are personally relevant topics that he frequently chose to speak about. We elicited narratives on these three different topics to guard against the possibility that one topic was more practiced or more difficult. Narratives were collected at five points: before and after each treatment block, and ten weeks after completion of the second treatment block. The same three narrative topics were elicited at each point. Each narrative was collected on a separate day.

Naïve listener ratings of social-communicative effectiveness: To assess change in the communicative effectiveness, we developed a Conversation Perception Questionnaire (adapted from a questionnaire developed by Murphy and Mast, nd). The questionnaire included 10 items (e.g., “I would feel at ease interacting with this person.”, “After listening to this, I would be nervous interacting with the person.”). Each item was followed by a scale ranging from 1 (“strongly disagree”) to 7 (“strongly agree”). Twenty listeners not familiar with the participant were recruited among undergraduate and graduate students of communication disorders at Emerson College. The raters had no experience evaluating or treating persons with aphasia, did not know the client, and were not aware of the purpose of the experiment. They listened to six 1-minute excerpts from the narratives elicited prior to treatment and after the second treatment block. Excerpts consisted of the first uninterrupted minute of each narrative. The six excerpts were digitized and randomly ordered. Each listener signed a consent form, listened to and rated one practice item, and then listened to each excerpt once and rated it.

Analysis and Results

We report below the analyses and results for a) the standardized measures; b) verb and noun production in the narratives (frequency of verbs and of nouns, noun-verb ratio, production of practiced vs. unpracticed verbs); and c) social-communicative ratings.

a) Standardized Tests

The subsection summary scores of the BDAE, for the most part, did not change. The one exception to this was the Auditory Comprehension subtests, which improved by an average of 17%ile points. Similarly, the composite score on the CLQT did not change; the participant remained in the mild impairment category of the CLQT. Summary scores for the BDAE and the CLQT are presented in Table 2.

b) Narratives

Analysis—The narratives were transcribed, checked by another listener for transcription reliability and each word was coded for grammatical category. We excluded from analysis repetitions of a prior word or utterance, interjections (including pause fillers), unintelligible words, formulaic expressions (e.g., *oh Jesus Christ*) and yes/no answers to a question. Interrater reliability of grammatical coding was checked for 30% of the data. Ninety percent of the words in the transcripts were coded identically by both coders.

Because each narrative contained a different number of total words, we used percentages (number over total words produced) to compare verb, noun, and verb-noun use over the course

of treatment. The number and percentages of all words, verbs, and nouns, are presented in Table 3.

To assess change, we calculated the effect size of the difference between testing occasions. For example, to assess change following the first treatment block, we subtracted the average of Baseline 1 from the average of Post-treatment 1 and divided the difference by the standard deviation of Baseline 1. Differences between two occasions that yielded an effect size greater than 1 are taken as substantial (e.g., Beeson & Robey, 2006).

Overall productivity: The average total number of words produced per narrative did not change significantly following the first treatment block (from 159 to 201, effect size < 1), diminished following the period of no treatment (from 201 to 93, effect size = -1.96), increased following the second treatment block (from 93 to 166, effect size = 8), and did not change from between the second treatment block and follow-up (166 to 190, effect size < 1). (See Table 3.)

Directly treated elements: Verbs—As can be seen in Table 3, percentage of verbs increased from a mean of 3.6% pre-treatment to 4.5% following the first treatment block (effect size = 4.7) and to 8.6% following the second treatment block (effect size comparing pre-treatment 2 to post-treatment 2 = 2.2; comparing pre-treatment 1 to post-treatment 2 = 8.2). There was a small and not significant decrease following the period of no treatment between the two treatment blocks to 3.9% (effect size < -1). Verb production at follow-up ten weeks following treatment was 5.5%, representing a small decrease from post-treatment 2 (effect size from post-treatment 2 to follow-up < -1) but remained significantly higher than verb production prior to treatment 1 (effect size pre-treatment 1 to follow up = 3.0).

Over the course of the therapy, the participant also produced more auxiliary verbs and verb inflections. Before treatment, he produced no auxiliary forms, whereas following treatment, 21% of his verbs were accompanied by an auxiliary. Before treatment, 12% of the verbs contained the present progressive inflectional marker ‘-ing’, whereas following treatment, 53% of the verbs were produced progressive ‘-ing’ form.

Untreated elements: Nouns—To explore whether the increase in verb production was limited to verbs or manifested in other grammatical categories that were not targeted during treatment we compared the percentage of verbs to the percentage of nouns produced before and following treatment. We compared nouns and verbs because both are lexical content word categories. As can be seen in Table 3, the participant produced more nouns than verbs in all narratives. In contrast to the increase in verb production following treatment, the percentage of common noun production did not change significantly over the course of study. None of the comparisons in noun production between treatment blocks yielded an effect size greater than 1.

Verb-noun ratio—A crucial relationship in well-formed language is the relationship between noun and verb production (Rochon, et al., 2000). This is represented by the ratio of verbs to total number of nouns and verbs produced (i.e., verbs/(nouns + verbs). We found a marked increase in this ratio, from .097 at the initial assessment to .12 following the first treatment block and to .20 following second treatment block. Although the post-treatment ratio is still below typical ratios (.35–.65, Rochon et al., 2000), it reflects progress towards a more typical profile. These data are shown in Figure 1.

Variety of verb production—To determine whether we had achieved the goal of increased verb production in general, not just production of the verbs practiced in therapy, we examined the number of verbs produced in the narratives following treatment that were neither present in the pre-treatment narratives nor introduced in the therapy session. The participant produced

29 different verbs following the second treatment period. Fifteen (52%) were neither produced in pre-treatment narratives nor introduced in therapy. The new verbs included both common (e.g., *get*) and less common verbs (e.g., *lifeguarding*). Furthermore, the number of *different* verbs produced increased from 13 in the pre-treatment narratives to 19 following the first treatment period, remained at 18 following the period of no treatment, increased again to 30 following the second treatment period, and remained at 26 at follow-up.

c) Social-communicative rating

Using mean ratings for the 20 raters across the 10 questions, a t-test revealed a small but significant difference in the expected direction, with more favorable ratings for the post-treatment measures (pre-treatment, 4.4 (SD = .73), post-treatment, 4.7 (SD = .67), $t(19) = -3.36$, $p = .003$).

DISCUSSION

Our goals in this study were to: 1) examine efficacy of a narrowly-defined constraint-induced aphasia treatment (CIAT) incorporating a relatively intense schedule, constrained verbal output form, and informative interactions, 2) assess the social-communicative validity of the measured improvement following treatment. The discussion focuses on how features of this particular treatment protocol might have influenced the outcome of the study and how they might enhance CIAT protocols more generally.

Constraining constraint-induced aphasia treatment

Past studies of CIAT have constrained language production by encouraging functional, goal-directed verbal output and discouraging non-verbal communication. In our study design we further constrained the participant's output by requiring him to produce verbs in informative interactions. This goal was determined by the participant's particular difficulty with verbs and his desire to increase verb production. The treatment was successful insofar as the participant demonstrated an increase in verb production in narratives following treatment. This increase in verbs contrasted with no change in the percentages of nouns produced. (There were some word classes that were produced less often after treatment [e.g., adverbs]; a discussion of all word classes produced is beyond the scope of this paper).

Another aspect of the CIAT protocol reported here is the emphasis placed on informativeness through the use of barrier tasks, story construction, etc. Typical conversations contain informative exchanges, in which the listener does not know what the speaker is about to say and new information is exchanged. By contrast, many traditional treatment protocols engage clients in practice producing pre-determined target responses that do not add any information to the verbal exchange. It is possible that the emphasis on informativeness in this protocol may (1) have contributed to the client's motivation to be engaged in the treatment and (2) account for increased verb production in the comparably informative outcome task of generating a personal narrative.

We note that the repertoire of verbs produced in the post-treatment narratives was substantially different from the verbs used in the pre-treatment narratives (where he produced few verbs) and from those used during treatment. This potentially demonstrates generalization to unpracticed items and stands in contrast to previous (non-CIAT) studies that targeted verb generation and found little or no generalization to untrained items (e.g., Raymer & Ellsworth, 2002; Rodriguez, Raymer, & Gonzalez Rothi, 2006). The generalization to untrained items suggests that the treatment facilitated access to verb knowledge generally, not the memorization of a limited set of practiced items. We attribute this outcome to the structure of the treatment protocol in which verbs were required in every exchange and it was less important

which verb the participant produced, as long as the verb was informative, i.e., distinguished one picture from the other successfully (e.g., *jogging*, *running*, *trotting*, *exercising* would all be acceptable to describe a picture of a person running, if they distinguished that picture in the given array). We hypothesize that this aspect of the protocol, by emphasizing the production of verbs in general, not specific verbs, contributed to the generalization observed.

In previous CIAT studies, improvement following treatment was typically found in standardized tests (e.g., the Western Aphasia Battery in Maher et al., 2006; the Aachen Aphasia Battery in Pulvermüller et al., 2001). We did not find overall increase in the BDAE or the CLQT, with the exception of the score on the auditory comprehension subtests of the BDAE. We attribute this improvement to the treatment tasks, which, by virtue of each turn building on conversational exchanges, require close monitoring of auditory input. We suspect that the standardized measures do not reflect the improvement we have documented because they are not designed to test verb production in conversational contexts. We note, though, that there was an increase in number of verbs produced in the narrative elicited by the Cookie-theft picture, from 10 tokens of verbs with seven different types to 13 verbs with 11 different types across the treatment period. Also in contrast to previous CIAT studies, we did not find increase in overall speech output. These differences can be attributed to the differences in the design, tasks employed and the treatment goals between those studies and the present one.

Finally, we employed a schedule that was more intense than the schedule used in typical aphasia treatment of chronic aphasia, but less intense than that typically used in CIAT studies. The optimal parameters of intensity have yet to be determined and we contribute these data to suggest that a more moderate level intensity than is used in other CIAT protocols may be efficacious.

Social-communicative validation

In the long run, what is important in aphasia rehabilitation is not that an individual with aphasia can produce more of any particular linguistic structure, but that the improvement positively impacts her or his social-communicative interactions in daily life. Prior research has developed and used social-communicative validation measures, including family-centered questionnaires (e.g., Glueckauf et al., 2003) and analysis of conversation (e.g., Hickin et al., 2001). Few investigations have included naïve listeners' ratings of participants' speech (but see Jacobs, 2001). In our study, we assessed whether potential conversational partners could perceive socially relevant communicative changes in the participant's verbal output when comparing his speech before vs. following treatment. The results indicated that naïve listeners judged the participant more favorably (e.g., the communication was "less awkward", "more successful", interacting with this person would be "less stressful") in post-treatment speech samples as compared to pre-treatment speech samples. This finding suggests that the participant was perceived as a more competent communicator, and therefore a better communication partner following treatment (Kagan et al., in press; WHO, 2001). While we exercise caution in interpreting this finding due to the relatively modest change in rating, the results highlight the potential contribution of social-validation measures and add to the literature one such tool and preliminary data suggesting that CIAT can bring about perceptible, measurable and relevant improvements in communication ability (e.g., Barther et al., 2007).

Open questions and future research

The single-subject investigation reported here yielded increased verb production in an individual with non-fluent aphasia treated 12 years after the aphasia onset. However, because this study did not directly contrast treatment protocols we cannot determine the relative contributions and possible synergistic effects of the components of our design. Several caveats of this study should be mentioned. For instance, in this study narratives on the same three topics

were elicited at each point. Therefore the increases in performance (i.e., verb production) could potentially be attributed to practice effects of producing the same narratives on five different occasions one month apart. The increase in verb production in the narratives following the periods of treatment and no increase following the no-treatment blocks, however, suggests that the increase in verb production was treatment-related. In addition, in this study we are not able to unequivocally dissociate the effects of our treatment and potential effects of participation in weekly conversation group sessions. Again, because the participant demonstrated increased verb production following the two treatment blocks, but not following the no-treatment block (during which he continued group therapy), we suggest that the effects observed are not due to participation in the conversation group. Finally, this was a within-subject study of one individual; additional cases will be needed to further test the potential applications and effects of this treatment approach.

Acknowledgments

We thank Kathryn Tison for her help in administering the treatment and coding the data, and to Lauren Nehilla and Jen Lyonnais for their help with data entry. We are grateful to Laura Glufing-Tham and Amy Litwack, for their assistance prior to and during data collection. We also thank Marianne Schmid Mast and Nora Murphy for providing their Conversation Perception questionnaire. And we thank our participant for taking part in this study. We are also grateful to Marcus Meinzer and an anonymous reviewer for their helpful comments. Support for Mira Goral was provided by NIH grant GM081113.

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Appendix A

Vacation (pre-treatment)

Oh, boy, the canyon. [Name] and m and the canyon. Lots of...over here, over here, over here. Beautiful, beautiful. Then maybe over here. The over here – beautiful. Then over here, nice, nice. '91, 90, '91, '91, '92. I don't know, but.... Airplane. Airplane but small. Maybe five, six, seven, eight, nice, then pass- passengers. Small plane. Big plane, uh, Arizona. But south. Then the small plane. Maybe a little bit. Then drive a car all the way ar- Then drive back up Arizona. South. Beautiful country. And then and then. Cactus and plants. Nothing. Down and then up. Then beautiful country. Over here, um. Listen to me and over here. Plants. Three, five, six, seven, ten, eleven, twelve, thirteen and beautiful country. I can't believe it. And the desert over here and desert over here. And then beautiful hills. Countryside. And here river and beautiful. Oh, maybe you someday. Maybe you someday. I can't believe it. Beautiful. Oh, yeah, and then downhill.

Vacation (post-treatment 2)

Maybe one day here and vacation on the river. The ocean alright. Me, I don't care. But two, four girls and one boy, vacation. [Name] vacation but the girls... [Name] lifeguarding on the waterfront. Waterfront. Ah, Jesus Christ, maybe two or three years. The Fixin' inside, fix the inside, upstairs then downstairs, all over the place. Painting the wall and ceiling and the floor. Yes, but fixing. Then maybe one, one o'clock, two o'clock in the afternoon, sit down and eating lunch. But no talking. No talking. Maybe one or two sentences, that's it. No talking. So I can't. Maybe screwed up too. Screwed up. The stroke. So maybe sit down. But the other girls and boys are painting. Wall painting. Well, maybe low tide. Low tide on the beach. Walking the beach. Maybe all the way down here. Maybe all the way over here. Low tide. And then high tide over here. The beach – low tide. [Name] is lifeguarding. So maybe over here, lifeguarding nice to four. Lifeguarding. Maybe low tide, nice. But high tide walking along the.... No, high tide, nothing.

Biographies

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FIGURE 1.

Mean percent verbs and nouns produced (bars) and the ratio of verbs to number of verbs and nouns multiplied by 100 (line) for three narratives pre- and post- treatment.

Table 1

Treatment Tasks

Task	Description	Materials	Blocks
1. Repetition ¹	Subject was instructed to repeat sentence after clinician. (e.g., <i>The girl is drinking.</i>)	Sentences matching the pictures for tasks 3 to 6.	1
2. Reading ¹	Subject was instructed to read the sentence from task 1 with the main verb underlined. (e.g., <i>The girl is drinking.</i>)	Same as Task 1.	1
3. Picture Description	Barrier Task. Subject and clinician had the same array of 10 pictures on either side of the barrier. Subject was instructed to describe 1 of the pictures using an S-V-O sentence and the clinician guessed which picture he was describing. (e.g., <i>The girl is drinking.</i>)	5 sets of 10 pictures of people performing actions. Downloaded from the internet using the Google image search engine. Designed to elicit S-V-O sentences	1
4. Go Fish	Barrier Task. Subject and clinician played Go Fish as a language game using pictures. 5 pictures were dealt to each person out of a deck of 10 pairs. The subject was instructed to request a matching picture using the carrier phrase "Do you have..." followed by a sentence with S-V-O structure.	Same as Task 3.	1 & 3
5. Memory	Subject and clinician took turns selecting and describing picture cards using S-V-O sentences. Two cards were selected in each turn, and removed after matches were found.	Same as Task 3.	1 & 3
6. Complex Picture Description	Barrier Task. Same as task 3.	Black and white pictures of complex scenes from the <i>Sentence Production Program for Aphasia</i> (Helm-Estabrooks & Nicholas, 2001)	1 & 3
7. Phone Call	Script was generated for calling information and asking for a phone number. Script was practiced using a barrier and then over the phone with the clinician. Phone calls were placed to information.	Script, pencil & paper, phone.	1
8. Reversible Sentence Description	Barrier Task. Subject and clinician had the same array of 6 to 8 pictures on either side of the barrier. Subject was instructed to describe a picture (using an S-V-O sentence) and the clinician guessed which picture he was describing.	10 sets of black and white pictures with people and animals performing actions, from the <i>Kempler Comprehension Task</i>	3
9. Picture Sequencing	Barrier Task. Subject and clinician had the same array of pictures on either side of the barrier. Subject was instructed to put the pictures in any order and produce an S-V-O sentence for each one. The clinician guessed the order and then compared.	a. 7 sets of 5 pictures with various themes. b. 5 sets of 10 pictures with various themes from <i>Everyday Life Activities</i> (Stark, 1998)	
10. Story Generation (using pictures)	The subject was shown a complex picture and asked to produce 1 sentence about what might have happened before the scene in the picture, another sentence about the picture and a 3 rd sentence about what happened after the scene in the picture.	Black and white pictures from <i>The Familiar and Novel Language Comprehension Task</i> (Kempler & Van Lancker, 1996)	3
11. Story Generation	The subject and the clinician took turns saying S-V-O sentences to form a story. (e.g., Clinician: "The man walked into a restaurant." Subject: "The man is sitting down.")	None	3
12. Recounting Episodes	30 second clips from movie trailers were played and the subject was instructed to recount them using S-V-O sentences.	Movie trailers from www.apple.com/trailers/	3
13. Conversation	At the beginning of each session the subject was asked to relay "new" information to the clinician.	None.	3

Note: In all tasks, the crucial production from the client was the production of an intelligible verb (either in isolation or in a clause/sentence, depending on the task). If he could not produce an intelligible and interpretable verb (or sentence containing a verb), he would first be given a general cue. For instance, if he named only an object in a picture, he would be asked/reminded to name an action. If he produced a sentence missing a verb, he would be asked to say the sentence again including a verb. If that was not successful, he would be given a specific cue, which varied to be appropriate to the task. For instance, he might be asked a confirmation question (e.g., "are you asking about the picture with the man surfing?") after an unclear description of a picture. If the specific cue was not successful, a target was modeled for repetition (if the clinician could identify a target). If modeling was not feasible or did not lead to a correct repetition, the turn was skipped (this happened seldom with our particular client).

¹Used only to introduce the participant to the notion that he should produce a sentence containing a verb. In fact, this was only necessary during the first several sessions, typically for about five minutes at the beginning of the session. After that, he remained cognizant of the goal and the importance of the verb.

Table 2

Pre- and Post-treatment Scores on the BDEA and the CLQT

	Pre-Treatment	Post-treatment	Change
BDAE	%ile	%ile	
Auditory Comprehension	27	43	+17
Cookie-theft Picture	13	11	-2
Articulation	38	40	+2
Recitation & Music	80	78	-2
Repetition	55	53	-2
Naming	37	30	-7
Reading	26	19	-7
Writing	18	26	+8
CLOT	Cumulative	Cumulative	
Attention	200	190	-10
Memory	138	122	-16
Executive Functions	28	27	-1
Language	25	22	-3
Visuospatial Skills	100	95	-5
Composite	3.4 (Mild)	3.2 (Mild)	-.2

Table 3
Numbers and Percentages of Total Words, Verbs, and Nouns Produced in Three Narratives at Five Testing Times

	Career	Family	Vacation	Mean	SD
	All Words				
Baseline 1	196	172	109	159.00	44.93
Post-treatment 1	262	183	157	200.67	54.68
Baseline 2	103	85	92	93.33	9.07
Post-treatment 2	166	129	203	166.00	37.00
Follow-up	177	227	165	189.67	32.88
	Verbs				
Baseline 1	4.1% (8)	3.5% (6)	2.8% (3)	3.6% (5.67)	.01% (2.52)
Post-treatment 1	3.1% (8)	15.5% (10)	5.7% (9)	4.5% (9.00)	.01% (1.00)
Baseline 2	1.9% (2)	7.1% (6)	3.3% (3)	3.9% (3.67)	.02% (2.08)
Post-treatment 2	2.4% (4)	13.9% (18)	10.3% (21)	8.6% (14.33)	.06% (9.07)
Follow-up	5.1% (9)	5.7% (13)	5.5% (9)	5.5% (10.33)	.00% (2.31)
	Nouns				
Baseline 1	27.6% (54)	26.7% (46)	24.8% (27)	26.6% (42.30)	.01% (13.87)
Post-treatment 1	22.9% (60)	27.9% (51)	22.9% (36)	24.4% (49.00)	.03% (12.12)
Baseline 2	19.4% (20)	24.7% (21)	18.5% (17)	20.7% (19.33)	.03% (2.08)
Post-treatment 2	24.7% (41)	24.0% (31)	28.6% (58)	26.1% (43.33)	.03% (13.65)
Follow-up	20.9% (37)	24.2% (55)	25.5% (42)	23.6% (44.67)	.02% (9.29)