Effects of Constraint-Induced Aphasia Therapy on Discourse Structure
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Introduction
Constraint-Induced Aphasia Therapy (CIAT) is an intensive intervention procedure for individuals attempting to recover communication functionality after stroke. Modeled on procedures used to facilitate recovery of motor function (Taub, Uswatte and Pielikiti, 1999), CIAT utilizes techniques which focus on maximally challenging activities while constraining use of compensatory strategies. Anecdotally, patients who participate in CIAT have been noted to demonstrate improvement of their conversational abilities of patients, but most reports of have focused on formal test data and/or restricted therapy methods (e.g. Pulvermüller, Neininger, Elbert, Mohr, Rockstroh, Koebbel, and Taub, 2001). This study examines discourse skills relevant to informative, fluent and appropriate conversation in two individuals who participated in a CIAT program. Comparing each subject before and after treatment allows a comparison of aspects of discourse which might specifically be affected by participation in CIAT.

Treatment Program
Treatment was provided using the Aphasia Rehabilitation with Re-learning using Constraint Principles (ARRC-P) protocol based on constraint-induced movement therapy principles. The treatment protocol included 3.5 hours of treatment, 5 days per week for 2 weeks (10 total sessions), with one 30-minute break provided each day. Standard therapeutic activities targeting functional verbalization were used. However, activities were modified to be at a significantly challenging level, or at a level where adequate responses could be achieved independently approximately 50% of the time within 2-3 minutes. The therapist provided only minimal feedback to alert client to revise a response. The subject’s initial attempt was allowed to continue up to the point at which it was felt that patient could no longer progress independently toward a correct response; at that point, successively more informative cues were provided until an accurate response was achieved. Once the accurate response was achieved, the clinician repeated the accurate response and the conversation resumed. Therapy sessions included additional structured activities targeting mental flexibility and higher-level word-finding, with the same cueing restrictions during initial responses.

Subjects
Subject 1, a 67 year-old man, was seen 5 years, 11 months after a left-hemisphere stroke. No specific information regarding initial classification of aphasia type or site of lesion was available. He reported years of speech therapy following his stroke, with some improvement in communication skills. He was described as an anomic aphasic at the time of inclusion in the program, with frequent word-finding difficulty during spontaneous
speech. Spontaneous utterances were often incomplete or revised. He had not had speech therapy for 2 years prior to enrollment in the CIAT program.

Subject 2, a 69-year-old man, was enrolled in a CIAT program 2 years and 11 months after a stroke. Neurological damage was thought to be related to a carotid artery dissection in the left hemisphere with subsequent thrombosis. S. presented with mild Broca’s aphasia, with repetition and spontaneous speech mildly impaired. He also had frequent word-finding difficulty as well as extensive circumlocution during spontaneous speech. He reported ongoing traditional speech therapy at the time of CIAT. Previously, he participated in 2 weeks of CIAT therapy in July 2006, and 4 weeks of CIAT therapy in June 2007.

**Discourse Analysis**

Conversation samples from the initial and final assessment sessions were analyzed for specific discourse skills which either “facilitated” or “inhibited” the discourse. Two of the authors independently transcribed the samples with an agreement rating of 98%. Each sample was coded independently, with coding scores reflecting a consensus between the coders and the first author. The discourse characteristics included in this study were:

1. **Discourse “facilitating” characteristics**: aspects of discourse which facilitate information flow, contribute to the verbal sophistication of the interaction, etc, including:
   - **topic-related skills**: utterances with appropriate introduction of new topic, or elaboration on an existing topic.
   - **informativeness**: utterances which were understandable, complete, and which added information to the conversation
   - **cohesion**: utterances with linked referencing, temporal and/or clausal cohesion
   - **use of conversation markers**: including overt markers of new information, overt repair or apology for confusing information, and/or narrative/story-telling markers
   - **syntactic complexity**: including sentences in the passive voice, with relative or infinitival clauses, or topicalization

2. **Discourse “inhibiting” characteristics**: those aspects of discourse which inhibit (or completely impede) conversation and information flow, including:
   - **noninformativeness**: including empty words, perseverations, paraphasias, pronouns without a clear referent, verbosity, or unnecessary repetition of information. Note that utterances can contain both informative and noninformative elements: these are not mutually exclusive codes.
   - **nonfluency**: including overt word-finding difficulty, unnecessary pauses, and/or repetition of words or syllables
   - **no response**: including lack of response and unrelated/inappropriate responses
Results

Results are presented below, in Figures 1 and 2 below. Scores for each subject are represented as change in percentage of utterances scored as embodying an attribute of discourse (either increase or decrease) from pre-treatment conversation sample to the post-treatment conversation sample.

Figure 1: Changes in discourse facilitating characteristics after CIAT

As can be seen above, the greatest increases in “discourse facilitating” characteristics were in the use of topic-related skills and utterance informativeness. For both subjects, the “after” sample can be characterized as having longer exchanges (more utterances) related to a single topic, as well as an increase in “informativе” utterances, which were complete without being either verbose or telegraphic. Cohesion, syntactic complexity, and conversational markers were not increased following CIAT.

Figure 2: Changes in discourse inhibiting characteristics after CIAT
As expected, the increase in informative utterances in the discourse of both subjects coincided with a decrease in noninformative utterances, including empty words, perseverations, paraphasias, and pronouns with no referent. Non-responsiveness was unchanged following CIAT, and the subjects differed in the degree of nonfluency post-treatment.

**Summary**

In this pilot study of two stroke survivors, there were measurable changes in conversational abilities following an intensive remediation program based on the principles of CIAT. While discourse structuring skills did not improve “as a piece” following treatment, the greatest increases in “discourse facilitating” characteristics were in the use of topic-related skills and utterance informativeness. For both subjects, the “after” sample can be characterized as having longer exchanges (more utterances) related to a single topic, as well as an increase in “informative” utterances, which were complete without being either verbose or telegraphic.

We look forward to expanding this research with a larger group of subjects participating in CIAT sessions. We also plan to examine formal test data to determine the extent to which improvement in discourse skill is reflected in improvement on formal test data. Finally, we look forward to contributing this data to the ongoing efforts to examine the efficacy of CIAT for individuals with stroke-induced aphasia.

**References**


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