Introduction

The effectiveness of language therapy provided to aphasic clients is measured by the degree to which the client shows improvement:

a) on those language stimuli which are the target of intervention, and also

b) on untreated stimuli or,

c) in other modalities or natural communicative settings not directly treated.

The issue of *carryover* or *transfer* or *generalization* of therapy effects in a) to c) is thus relevant when conceptualizing effective language therapy protocols and when considering language data from pre- and post- tests. With this in mind, the idea for this paper was prompted by a question posed by Doyle and Goldstein (1985) in their paper: "Experimental Analysis of Acquisition and Generalization of Syntax in Broca's Aphasia". In discussing their findings, Doyle and Goldstein provide another explanation for the lack of generalized responding. They state that it was perhaps not due "to shortcomings of the HELPSS protocol, but rather, to the multidimensional nature of the deficits that define Broca's aphasia". In other words, can we expect a program whose purpose is to "improve grammatical skills of adults with acquired aphasia" (Helm, 1981) to have an effect on the phonologic-prosodic and word finding deficits that are common symptoms of Broca's aphasia?" (p.212)

In this paper we respond to this question in the affirmative and substantiate our claim by providing language test and therapy data from a client with Broca's aphasia. This client received several therapy protocols aimed at improving oral sentence production. Concomitantly his articulation, prosody and word finding improved measurably. The oral production of the same single words produced in early versus late test and therapy sessions are compared in terms of their articulation, word finding and oral sentence production. Assumptions as to why improvements in the directly treated oral sentence production carried over to articulatory ability and word finding ability are discussed.

Method
Client Information

At the age of 40, TH., a right handed male, radio announcer, suffered a left frontolateral intracerebral hemorrhage after a mycotic aneurysm followed by a massive left hemisphere CVA. TH initially presented with global aphasia. Language testing at 14.5 months post onset revealed a Broca's aphasia with severe agrammatic sentence production, apraxia of speech and asyntactic comprehension. His word retrieval was particularly impaired for verbs and prepositions.

Procedure

Language testing

Qualitative language testing was carried pre- and post-therapy. It encompassed a one-hour interview for spontaneous speech, Boston Naming Test (BNT), Boston Action Naming Test (ANT), ANELT, picture descriptions (including 'Cookie Theft', BDAE), the narrative Cinderella, oral sentence production test (SPT), auditory sentence comprehension, etc. Responses to test items produced in the early pre-therapy testing for BNT, ANT and SPT were compared with later productions of the same words in terms of number of correct responses and articulatory agility. Sixty target words were singled out that exhibited articulatory difficulties in early tests to enable a comparison of the same words in terms of phonetic and phonological parameters including phoneme selection, distinctive features, manner and place of articulation, vowel length, phonological processes, syllable structure and prosody within the framework of generative and metrical phonology.

Therapy Protocols

Five language therapy protocols were provided to TH to date, each consisting of 60 one-hour sessions with extensive pre- and post-therapy language testing. The first two protocols incorporated a multi-step procedure aimed at facilitating oral sentence production to picture stimuli. In the third and fourth protocol written sentence production was incorporated. The fifth protocol expanded on the previous four protocols of oral sentence production by including the oral production of mini-discourses and dialogues. Each session was audio- and videotaped and selected sessions were transcribed for analysis.

Results

In Figure 1 the percentage of correctly produced items is depicted for six test times for the Boston Naming Test, the Boston Action Naming Test and for oral sentence production to picture stimuli depicting activities requiring one- to three-place place predicates and the necessary arguments depicted.

Insert Figure 1

On the Boston Naming Test an increase from 7% to 67% items correctly named was observed and for the Action Naming Test from zero to 82.5%. His oral production of correct sentences increased from zero to 79 % correct (from 43 items).

In Figure 2 selected words are provided in a narrow IPA transcription from early test sessions versus late test sessions. TH's articulation for all of the sixty target words showed

Insert Figure 2

marked improvement in all the analyzed parameters in the direction of normal pronunciation on the word- to sentence level. TH's discourse production as evaluated by the Cookie Theft description and the ANELT procedure also improved markedly. On the ANELT, TH's performance showed an increase from 34% to over 87% of the maximum points over test times. Within a therapy session, the average length of TH's orally produced sentences across trials increased from 4.5 words to over 11 words.

Discussion

Longitudinally TH showed significant gains in oral sentence production. However, he also showed marked improvement in his articulatory ability, word finding for nouns and for verbs as tested by the BNT and the Action Naming Test. A carryover to everyday life scenarios (ANELT) was also observed. Why do we expect TH's articulation, prosody and word finding abilities to improve concomitantly to his oral sentence production? The administered therapy protocols were directed at formulating sentences to picture stimuli for oral production in an incremental fashion. Each protocol required multiple repetitions of the components of each sentence worked on. The intensive training in thinking about to describe a depicted activity, formulating and then producing sentences not only resulted in improved verb and argument retrieval, but also improved his word finding and articulation of nouns, verbs and adjectives. A basic tenet of the protocols was to stick to his production when it was semantically adequate and to correct phonemic errors and help when articulatory difficulties were hindering TH from continuing and/or completing a sentence. Minimal errors were not corrected. This would have resulted in frequently interrupting his speech flow and caused greater frustration over his difficulties. Thus, the structure of the therapy provided a context conducive to an improvement of articulation and word finding abilities in the course of producing sentences and discourse. In terms of Indefrey and Levelt's (2000) model, in the process of working on grammatical encoding the interactions among the other modules situated in the formulator were strengthened. The intensive, structured retrieval of lemmas resulted in an improved morpho-phonological encoding which in turn provided better access to lexemes and to the respective phonetic/articulatory plans including all the prosodic

parameters. Focusing on grammatical encoding drew off the attention from articulation which led to more accurate and automatic articulation.

Kleim and Jones (in press) discuss the implications of ten principles of experience-dependent neural plasticity also with regard to language rehabilitation. Video examples from test and therapy sessions will be presented to demonstrate how these principles can be used to account for why articulation and word finding as well as oral sentence production improved. In particular, *use it and improve it*, *repetition*, *intensity*, *time* and *salience matters* are relevant for interpreting TH's language performance in recovery. In this presentation we follow Stokes & Baer's (1977) suggestion to systematically measure and analyze those variables assumed to have been functional in TH's observed generalization.

References

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