Title
Relationships among syntactic, semantic, and pragmatic abilities in treated aphasic adults during the first postonset year

Author
Roberts, Jan Avent

Publication Date
1988

Peer reviewed|Thesis/dissertation

Relationships Among Syntactic, Semantic, and Pragmatic Abilities in Treated Aphasic Adults During the First Postonset Year

by

Jan Avent Roberts

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Speech and Hearing Science

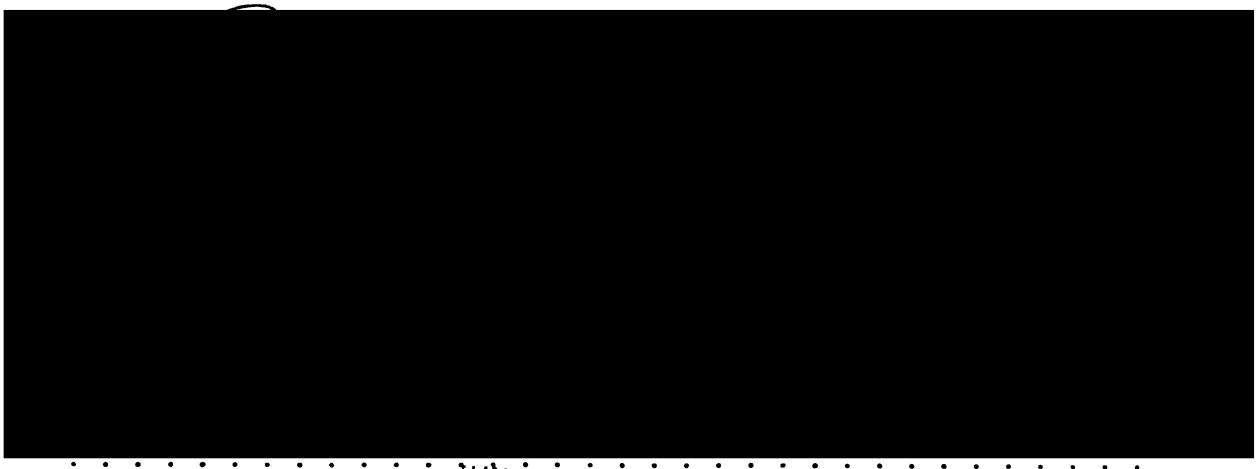
in the

GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA

San Francisco



Date JUN 12 1988 **University Librarian**

Degree Conferred: . . . . . .

This dissertation is lovingly dedicated to

my husband Andy

ACKNOWLEDGMENTS

Just like the turtle sitting on top of the fence, I did not accomplish this challenge without some help. First of all, I would like to thank my committee members for their invaluable help and guidance--Dr. Richard Flower, chairman, Robert T. Wertz, Art Schwartz, and Carol Prutting.

My friends, Kay Hibbs, Ellen Bernstein-Ellis, Yvonne Shubitowski, Delaina Batson, and Martha Williams, provided support, advice, and encouragement. Thank you all for being the best.

My family showed tremendous patience and support. Thank you mom, dad, and Ingrid. Phone calls and chicken soup were never appreciated more.

Now that one challenge has been met, I'm ready to move on and widen my circle of experiences. No doubt Sparky and Scooter will continue to contribute to life's necessities and for that I'm grateful.

One last thank you goes to my husband Andy. It's been a long journey and one that I could not have completed without you. When all is said and done, my greatest mentor has been you.

ABSTRACT

Relationships Among Syntactic, Semantic, and Pragmatic Abilities in Treated Aphasic Adults During the First Postonset Year

by

Jan Avent Roberts

The purposes of this study were to determine (1) whether the syntactic, semantic, and pragmatic aspects of aphasic language change over time, (2) how such changes differ from changes on a standardized language test and, (3) whether type of treatment or type of aphasia influences the amount of change in the various aspects of language. Twenty aphasic patients, 10 fluent and 10 nonfluent, participated in the study. Treatment was administered eight hours each week for 44 weeks between one and 12 months postonset. Ten patients received individual treatment, and 10 received group treatment. The data for this study were collected from videotaped language samples of conversation and a sentence elicitation task at 4, 15, 26, 37, and 48 weeks postonset and were analyzed by syntactic, semantic, and pragmatic measures of performance. The data were analyzed statistically by a repeated measures 2 (time) x 2 (aphasia group) x 2 (treatment group) analyses of variance and a 4 (time) x 2 (aphasia group) x 2 (treatment group) analyses of covariance with contrasts.

Results indicated that syntactic, semantic, and pragmatic aspects of language change over time in treated aphasic patients. The majority of these changes occurred during the first 15 weeks, however, improvement continued beyond the first 15 weeks. Comparisons among a standardized language measure and syntactic, semantic, and pragmatic measures of language indicated that a standardized test does not provide complete information about language performance over time. While the majority of language improvement across all measures occurred during the first 15 weeks, the patterns of language recovery differed among measures. Differences were observed among measures depending on type of aphasia, fluent or nonfluent, and treatment, individual or group. These differences support the need for syntactic, semantic, and pragmatic measures of language performance to supplement standardized langauge measures.

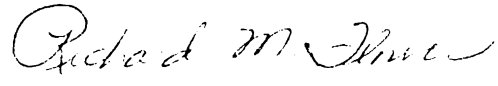


TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1

Introduction

Aphasia, a disorder which selectively impairs language, has been shown to improve over time with treatment (Basso, Capitani, and Vignolo, 1979; Hagan, 1973; Hartman and Landau, 1987; Ludlow, 1977; Shewan and Kertesz, 1984; Vignolo, 1964; Wertz, et al., 1981, 1986). This improvement in language performance has been documented almost exclusively with standardized test measures. However, the sole use of standardized measures of aphasic language performance has been questioned on several grounds.

From a clinical perspective, discrepancies exist between standardized language tests and observations of aphasic patients' conversational skills (Aten, Caligiuri, and Holland, 1982; Holland, 1980; Sarno and Levita, 1971; Ulatowska, Haynes, Hildebrand, and Richardson, 1977; Penn, 1983; Binder, 1984). Standardized test items are biased toward a linguistic framework without providing a clear understanding of how a patient uses his/her language (Ulatowska, Haynes, Hildebrand, and Richardson, 1977; Holland, 1980; Gurland, Chwat, and Wollner, 1982). Additionally, language performance varies in different contexts.

Standardized testing represents a fixed, metalinguistic context that may penalize communicative performance. Conversation provides a social context for language use that may enhance communicative performance.

A second criticism of standardized tests involves recent definitive changes in the scope of language. The inclusion of pragmatics within the traditional syntactic and semantic framework of assessment has broadened the view of communicative competence toward a societal perspective (Prutting, 1982; McTear, 1985). Most standardized aphasia tests omit assessment of pragmatic performance (Holland, 1980) and unfortunately present a narrow view of a patient's communicative skills.

Third, the use of test scores for describing language symptoms in aphasic patients has been questioned (Martin, 1977; Marshall, 1986). A test, composed of a small number of subtests, may minimize important language differences or similarities that exist between groups of patients such as fluent and nonfluent subtypes. Since standardized tests do not test any behavior in depth (Penn and Behrmann, 1986), they are clearly not the best measure for characterizing specific language performance in aphasic patients.

These criticisms of standardized testing are particularly pertinent to documenting language changes in aphasic patients as a result of treatment. In order

to gain more specific information about the amount and rate of language changes occurring as a result of treatment, additional measures that broaden the scope of language are needed to supplement standardized tests. While fluent and nonfluent aphasic patients have been differentiated on various syntactic, semantic, and pragmatic aspects of language (Binder, 1984; Ludlow, 1977; Penn, 1983), all three aspects have not been studied over time in treated fluent and nonfluent aphasic patients.

Rationale

The majority of aphasia treatment studies have used standardized tests to measure overall language change. It has not been determined whether the improvements represent (1) change across the various aspects of language or, (2) change in a particular aspect of language. The purposes of this study are to determine whether syntactic, semantic, and pragmatic aspects of language change over time in treated aphasic patients, to compare the rate and amount in each aspect, to compare change in each with change on a standardized language test, and to determine the influence of type of treatment and type of aphasia on change in each aspect.

Questions

The study was designed to answer the following questions:

1. Do pragmatic, syntactic, and semantic aspects of language change over time in treated aphasic patients?

2. What are the amounts and rate of change in pragmatic, syntactic, and semantic aspects of language as compared to the PICA Overall percentile score?

3. Is change in pragmatic, syntactic, and semantic aspects of language influenced by the type of treatment, group or individual, or the type of aphasia, fluent or nonfluent?

CHAPTER 2

Review of Literature

Formal methods for assessing aphasia have evolved over the last 60 years. In the 1920's, Sir Henry Head (Jenkins, Jimenez-Pabon, Shaw, Sefer, 1975; Darley, 1979) developed the first rigorous test battery for aphasia. This test highlighted the necessity for systematic and comprehensive data collection (Jenkins, et al., 1975).

In the 1930's, Weisenburg and McBride demonstrated the importance of standardized testing. Their five-year study of aphasia was the first to use a normal control group, to compare the performance of aphasic patients with nonaphasic patients with cerebral lesions, and to use standardized testing procedures (Jenkins, et al., 1975).

During the 1940's and 1950's, the first published aphasia test became available (Eisenson, 1946; 1954) for clinical use. However, the test was not standardized.

During the 1960's an emphasis on standardization and psychometric priniciples in test construction became prominent. The Language Modalities Test for Aphasia (Wepman and Jones, 1961), the Minnesota Test for Differential Diagnosis of Aphasia (Schuell, 1965), the

Porch Index of Communicative Ability (PICA) (Porch, 1967), and the Neurosensory Center Comprehensive Examination for Aphasia (Spreen and Benton, 1969) are examples of the tests published during this time. In addition to standardization, a linguistic orientation emphasizing syntax and semantics was evident in most test batteries. Also, an emphasis on the assessment of functional language skills (Sarno, 1969) began.

By the 1970's, new measures that assessed specific language modalities were developed, for example the Revised Token Test (McNeil and Prescott, 1978) and the Reading Comprehension Battery for Aphasia (LaPointe and Horner, 1979). Classification of aphasia into clinical subtypes was popularized by the publication of the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972). All of these tests continued to emphasize syntax and semantics, and while they were widely used, clinicians continued to question their validity as complete measures of language skills.

The 1980's have witnessed increased interest in the clinical evaluation of a deeper and broader range of communicative skills. The Communicative Assessment in Daily Living (Holland, 1980) was published to provide a measure of functional communicative skills that are not evaluated on more traditional standardized measures. Recently, several nonstandardized measures of pragmatics

have been proposed to describe comprehensive language use in dyadic interactions more adequately (Prutting and Kirscher, 1983, 1987; Penn, 1983; McTear, 1985). Though standardized tests are still prominent, growing dissatisfaction with their narrow clinical view of language is evident.

Standardized Testing

The purposes of testing for the assessment and treatment of aphasia are to: (1) detect the presence of aphasia (Orgass and Poeck, 1969; Goodglass and Kaplan, 1972; Darley, 1979; Linebaugh, 1979; McNeil, 1982); (2) provide an accurate description of a patient's language skills (Orgass and Poeck, 1969; Brookshire, 1973; Goodglass and Kaplan, 1972;), (3) establish a prognosis (McNeil, 1982; Brookshire, 1973; Linebaugh, 1979), (4) provide inferences regarding the site of the lesion (Goodglass and Kaplan, 1972; Linebaugh, 1979; McNeil, 1982), (5) provide a focus for treatment (Goodglass and Kaplan, 1972; Linebaugh, 1979; McNeil, 1982; Brookshire, 1973), (6) provide a measure of language change (McNeil, 1982; Brookshire, 1973), (7) determine the level of functional communication (Linebaugh, 1979), and (8) be reliable (Brookshire, 1973; McNeil, 1982). Thus far, it has been impossible for any one test to satisfy each of

these criteria. According to Marshall (1986) an aphasia test "neither can nor should be expected" to describe an aphasic patient's linguistic skills fully.

Although there is no consensus for any one test, standardized tests offer many advantages. First, through the use of psychometric principles, these tests provide relatively reliable and valid measures of selected aspects of language (Darley, 1979). Second, through sampling procedures, tests are practical in duration (Spreen and Wachal, 1973; Marshall, 1986). Third, test instructions are usually revised to reduce difficulties of presentation (Jenkins, et al., 1975). And, fourth, clinically tested materials are usually more effective because sources of errors or confusion have been reduced or eliminated (Jenkins, et al., 1975).

Standardized tests are not a panacea. Criticisms of the standardized measures are well documented. First, the theoretic bases of standardized tests have been criticized. In addition to the problem of construct validity, the definition and scope of language (Benton, 1967) in each test represents its author's bias toward the conceptualization of aphasic language assessment which may not reflect a valid definition of language.

Second, a standardized aphasia test, used in isolation, rarely provides the speech pathologist with

sufficient information to assess carefully the full range of deficits (Spreen and Risser, 1981; Marshall, 1986) or to provide for optimal treatment (Brookshire, 1973; Martin, 1977; Leonard, Prutting, Perozzi, and Berkley, 1978; Chapey, 1981; Crystal, 1982). For example, the results of a standardized test are reported as a score. This value placed on performance cannot capture the essence of an error (Marshall, 1986) or adequately account for linguistic variations among aphasic patients. A single score for sentence production may represent one or a variety of syntactic errors including omission of words, problems with word order, mixed verb tenses, etc. (Martin, 1977). Therefore, sole reliance on a test score limits the amount of information regarding the specific nature of the problem(s).

Standardized tests have also been criticized because of the dissociation between performance on tests and conversational interactions outside of the clinic (Taylor, 1965; Ulatowska, et al., 1975; Sarno, 1981; Foldi, et al., 1983; Beele, Davies, and Muller, 1984). This dissociation may be attributable to the emphasis on lexical, syntactic, and semantic skills on tests and the exclusion of pragmatic information (Drake, 1986) or functional skills (Sarno, Sarno, and Levita, 1971; Aten, Caligiuri, and Holland, 1982). In addition, recent

evidence demonstrates pragmatic behaviors in aphasic patients are less disrupted than performance on standardized tests implies (Penn, 1983; Binder, 1984; Penn and Behrmann, 1986).

A final criticism involves the lack of equivalence among subtests when comparing different standardized tests for aphasia. Nation and Corlew (1974) compared naming tasks in five different aphasia tests and Needham and Swisher (1972) compared auditory comprehension tasks from three different tests. Their findings were unanimous. Standardized tests are not equivalent in the testing of a particular aspect of language.

These criticisms are not meant to degrade the use of standardized tests. The adequacy of any test is ultimately determined by the clinician (Nation and Aram, 1977). And, each clinician's definition of language will determine the type of tests employed for assessment. According to Siegal (1975) language assessment is enhanced by a clinican

> who has some knowledge of research and theory in language, some experience in describing and dealing with important communication behaviors, and some reservoir of confidence in his or her own abilities to observe behavior, develop hypothesis, and change ideas and approaches when necessary (p. 213).

Therefore, when adequacy is limited or there is a mismatch between a test and a clincian's conceptualization of language, supplemental measures are

indicated.

According to Leonard, et al. (1978), nonstandardized measures, reflecting current theoretical shifts in the scope of language, can be used to complement standardized measures in order to obtain a broader representation of a patient's communicative abilities. Nonstandardized measures enable the clinician to test in greater detail specific aspects of performance, to examine performance not assessed on a standardized test, and to determine the scope of performance (Leonard, et al., 1978).

The Study of the Syntactic Aspects of Aphasic Language

Syntax is particularly prone to disruption following onset of aphasia (Lesser, 1978; Chapey, 1981). Syntax is defined as "the way words are combined to form larger units, such as phrases, clauses and (above all) sentences" (p. 98, Crystal, 1981). One aspect of syntax--the formulation of complex utterances--may be an important measure of language improvement over time and improved communicative competence.

Utterances become syntactically complex when phrases or clauses that express more than one relationship are combined in a single sentence (Bloom and Lahey, 1978; Ochs, 1983). However, the formulation

of complex utterances is extremely difficult for some aphasic patients. Ambiguity, word finding problems, and the use of "empty" referents in utterances is a salient feature of aphasic language. For example, instead of saying "I want something" or "I want uh uh," the main verb "want" could be followed by a clause that would eliminate the ambiguity, e.g., "I want to call home." As patients improve in their word finding skills and ability to produce sentences, improvements in the use of complex utterances might follow.

Most investigations of syntactic complexity in aphasic speech have studied chronic patients. The purposes of these studies have included documenting the frequency of occurrence of syntactic forms (Voinescu, 1971), testing the usefulness of applying transformational grammatical analyses (Myerson and Goodglass, 1972) or comprehensive syntactic analyses (Penn, 1983), describing linguistic complexity in procedural and narrative discourse (Ulatowska, et al., 1983, a, b), and quantifying aspects of spontaneous speech to determine aphasic subclassifications (Wagenaar, Snow, and Prins, 1975) and for differential diagnosis of neurologic syndromes (Halpern, Darley, and Brown, 1973). These studies indicate that aphasic patients generally produce utterances that contain less complex syntax than normal subjects. Differences in

complexity appear to relate more to the severity of the language impairment than to a specific neurologic syndrome.

Few studies have investigated changes in syntactic complexity that occur during language treatment. Ludlow (1977) studied the recovery patterns of ten aphasic patients, six Broca's and four fluent, between one and three months postonset. Elicited and spontaneous speech samples were obtained at one, two, and three months postonset. Treatment was initiated after the initial examination, however the nature of the treatment was not specified. Six measures were applied to evaluate the speech samples: mean sentence length, grammaticality index, sentence production index, complexity index, simple sentence variation index, and number of transformations in sentences. All measures except number of transformations increased linearly during the first three months postonset. The two groups of patients differed on syntactic complexity in both amount and rate of change. The fluent patients were superior to the Broca's patients at all time periods, and they showed the largest increase in complexity during the second month postonset. The Broca's patients did not improve in syntactic complexity until the third month postonset.

Prins, Snow, and Wagenaar (1978) compared

improvement in spontaneous speech in three groups of aphasic patients--nonfluent, mixed, and fluent. All patients had become aphasic "at least" three months prior to the beginning of the study and they were tested at three six-month intervals during the course of unspecified therapy. Spontaneous speech was scored on 28 variables, including syntactic complexity. They found that syntactic complexity differentiated the fluent and nonfluent patients. However, syntactic complexity did not improve significantly over time.

These studies suggest that syntactic complexity differentiates fluent from nonfluent patients and separates patients by the severity level of overall language impairment. Whether it improves with treatment is unclear. Acutely aphasic patients may show improvement in complexity, but chronic patients may not. The amount and rate of improvement occurring from acute through chronic phases of recovery is unknown. The effects of treatment on improvement are also unknown, because no information about the nature and amount of treatment is available from the above studies.

The Study of the Semantic Aspects of Aphasic Language

Semantics, the study of meaning, may provide a potential source of information about aphasic language

at the clausal level. But, semantic issues have, generally, received less attention than syntactic aspects of language (Marshall, 1986), probably because of the difficulty in measuring meaning. Lexical semantics, the investigation of word meaning, has received more attention than clausal level semantics (Lesser, 1978).

Semantic measures of clausal units have been used to describe severity of aphasia, differentiate among different neurologic disorders, compare syntactic and semantic abilities, and to describe the adequacy of verbalizations. These studies basically support a reduction in semantic abilities in aphasic patients.

Ulatowska, et al. (1983a, 1983b) compared aphasic subjects to normal subjects in procedural and narrative elicitation tasks. The language samples were rated by judges for coherence or plausibility, conventionality, and conclusiveness of the discourse. They found that aphasic subjects were able to communicate essential information but were rated lower on coherence than the normal subjects.

Using content analysis, Bond et al. (1983) compared moderately and severely impaired aphasic patients in an elicited story telling task. Their moderately impaired subjects were superior on both percentage of propositions and percentage of essential propositions

produced than their severely impaired subjects.

Nicholas, Obler, Albert, and Helm-Estabrooks (1985) investigated "empty speech" in four subject groups--patients with Alzheimer's dementia, Wernicke's aphasia, anomic aphasia, and normal controls. Elicited language samples were analyzed with 14 categories, such as empty phrases, indefinite terms, deictic terms, paraphasias, etc., presumed to contribute to noninformative speech. They found that the normal group was the most informative, and the Wernicke's patients were least informative. Alzheimer's patients and patients with anomia were similar, but anomic patients were more like the normals than any other group.

Yorkston and Beukelman (1980) compared mild and moderately impaired aphasic patients, normal controls, and geriatric speakers on an elicited language sample. They found that all groups conveyed the same amount of information, but the two aphasic groups were less efficient as measured by content units per minute.

Golper, Thorpe, Tompkins, Marshall, and Rau (1980) compared elicited language samples in mildly impaired aphasic patients, right hemisphere damaged patients, and nonbrain damaged geriatric patients. They found that the groups did not differ on amount of information conveyed. However, the aphasic group was significantly less efficient in rate of information conveyed than the

other two groups.

Kreindler, Calavrezo, and Mihailescu (1971) described the semantic skills of a patient with jargon aphasia. Answers to questions were rated on a four point scale of adequacy: (1) good answers; (2) good answers accompanied by many useless additions with no relevance to the questions; (3) answers with some vague relevance to the questions; and (4) answers with no relevance to the questions. They found that the majority of the patient's answers to questions were rated as vague or with no relevance.

Halpern, Darley, and Brown (1973) developed error criteria to describe quantitatively the speech of four different neurologic groups--aphasia, generalized intellectual impairment, apraxia of speech, and confused language. Their semantic criteria were adequacy and relevance. Adequacy was defined as accuracy of substantive words as well as the degree of elaboration. Relevance errors were bizarre responses that appeared unrelated to the stimulus. Their findings indicated that all patients had some difficulty with adequacy, but the groups could not be differentiated on this measure. Adequacy appeared to reflect severity of the disorder. Relevance errors were common for only confused patients.

Thus, a variety of semantic measures have been used to describe aphasic language at clausal levels. These

measures appear to reflect severity of the language impairment and may be a relevant measure of language change over time.

The Study of the Pragmatic Aspects of Aphasic Language

Pragmatics is the study of the meaning of language in context (Bates, 1976; Leach, 1983). Pragmatics concerns both the structural aspects of language, such as syntax and the extralinguistic aspects of language, such as nonverbal gestures (Levinson, 1983).

In a practical sense, pragmatics offers significant advantages over standardized test evaluations of aphasic language performance because of direct applicability to the single most important aspect of language use--face-to-face interaction or conversation (Levinson, 1983). Conversation is perhaps one of the most salient disordered features of aphasic language (Prins, Snow, and Wagenaar, 1978) and it is an important aspect of communicative competence.

Investigations of pragmatic skills in aphasic patients have focused, generally, on descriptions of chronic patients. Some studies have utilized elicited language tasks to evaluate selected pragmatic behaviors; others have evaluated conversational samples.

Early and Van Demark (1985) studied aphasic

patients' use of definite and indefinite articles to mark given and new information in an elicited language task. They found that aphasic patients produced a greater proportion of noun phrases with definite articles (given information) and produced fewer indefinite articles (new information) than non-brain damaged subjects. These results indicate that aphasic patients were less accurate in marking given and new information appropriately.

Busch and Brookshire (1985) studied aphasic patients abilities to encode referents and to respond to contingent queries during communicative failures in an elicited language task. They found that aphasic patients' referential skills were similar to nonaphasic patients and that both groups were able to provide crucial information during responses to communicative failures.

In another area of inquiry, Bates, Hamby, and Zurif (1983) investigated the effects of aphasia on topicalization and focusing of information. Broca's and Wernicke's aphasic patients' language was elicited in a sequenced picture task. The language samples were analyzed for the presence of lexicalization versus ellipsis, pronominalization, definite and indefinite article use, pragmatic word order versus variations in dative structure, and use of connectors. They found

that both groups were sensitive to lexicalization and ellipsis. In addition, the Broca's patients were sensitive to dative structure, while the Wernicke's patients were sensitive to the use of definite and indefinite articles.

In a study of narrative discourse, Bond, Ulatowska, Macaluso-Haynes, and May (1983) reported that all aphasic subjects exhibited preserved pragmatic skills. According to the investigators, the patients exhibited communicative intent, because their discourse was initiated without repeated instructions.

Cohesion analysis, based on the taxonomy of Halliday and Hasan (1975), has been used in several studies. Piehler and Holland (1984) assessed the usefulness of cohesion analysis in documenting language recovery during the hospitalization of two acutely aphasic subjects. They found changes in the number of cohesive ties in informal conversations during the initial stages of recovery and that the two patients, one fluent and one nonfluent, could be distinguished based on the pattern of cohesion.

In another study of cohesion, Lemme, Hedberg, and Bottenberg (1984) investigated the effects of stimulus structure on cohesive ties. The aphasic patients were instructed to construct oral narratives from three different visual stimuli of increasing structure: (1) a

set of toy dolls representing a family (least structured); (2) a Norman Rockwell print; and (3) an ordered sequence of pictures (most structured). They found no differences in cohesive ties among the three stimulus conditions.

Several comprehensive pragmatic assessment tools have been used with aphasic patients. Penn (1983) devised the Profile of Communicative Appropriateness to assess six aspects of pragmatics described by Levinson (1983): response to interlocutor, control of semantic content, cohesion, fluency, sociolinguistic sensitivity, and nonverbal communication. She evaluated fourteen chronic aphasic patients and compared their conversational pragmatic and syntactic performance. Syntactic performance was evaluated with the LARSP and pragmatic performance was rated for overall appropriateness in 20 one-minute conversational samples. She found no one-to-one relationship between syntactic and pragmatic abilities which suggests that both aspects of language should be assessed in the evaluation of aphasia.

Binder (1984) examined the pragmatic abilities of 11 fluent and nonfluent aphasic patients using the pragmatic protocol (Prutting and Kirchner, 1983). She further compared pragmatic performance with two clinical measures, the Western Aphasia Battery (WAB) (Kertesz,

1980) and the Communicative Abilities in Daily Living (CADL) (Holland, 1980). The aphasic patients demonstrated a high level of appropriate pragmatic abilities, and fluent patients, generally, displayed higher levels than nonfluent patients. Four behaviors, specificity/accuracy, fluency, pause time, and quantity/concisement, were found to be inappropriate for most patients in both groups. Binder also observed that patients displayed less impairment on the pragmatic protocol than on the CADL or WAB.

Wilcox and Davis (1977) developed a method for analyzing speech acts used by aphasic patients based on Searle's classification of speech acts. Three aphasic patients were videotaped in individual treatment and a social setting. Results of the speech act analysis in these two contexts revealed similar patterns of pragmatic abilities for the aphasic patients. In individual treatment, the patients produced a high level of assertions in response to clinician produced questions and requests. In the social setting, the patients continued to produce a high level of assertions, but also used some requests and questions.

Gurland, Chwat, and Wollner (1982) investigated the communicative abilities of aphasic patients with different communication partners and compared the results of a pragmatic analysis with a standardized

measure of communicative abilities. Two aphasic patients participated in the study. Each patient interacted with a familiar partner (spouse) and with an unfamiliar partner (speech pathologist). The interactions were rated with The Communication Profile and later compared to the CADL (Holland, 1980). The results revealed no one-to-one relationship between linguistic deficits and pragmatic abilities. While both patients demonstrated intact pragmatic abilities, only one of the two patients exhibited a similar pattern of pragmatic abilities with his spouse and a speech pathologist. The other patient exhibited a different pattern of communicative acts depending on conversational partner. Comparisons between The Communication Profile and the CADL found similar results however, communicative abilities were more broadly assessed with the The Communication Profile.

Prutting and Kirchner (1987) tested the usefulness of a descriptive pragmatic taxonomy to assess the conversational abilities of six different diagnostic groups. The groups consisted of children with language disorder, children with articulation disorders, children with normal language, adults with aphasia, adults with right hemisphere damage, and adults with normal language. They found that distinct profiles emerged from each group and that the number of

inappropriate pragmatic behaviors was low across subject groups.

These studies, involving both elicited and conversational samples, indicate that aphasic patients exhibit relatively preserved pragmatic abilities. Selective pragmatic deficits, particularly in the realm of structurally based or linguistic aspects, are evident. Furthermore, one study (Piehler and Holland, 1984) showed that during the acute phase of recovery, pragmatic skills improve.

Language Recovery Patterns of Treated Aphasic Patients

In general, the greatest language improvement in treated patients occurs within the first three months after a stroke (Ludlow, 1977; Wertz, et al. 1981). However, language improvements can continue over one (Wertz, et al., 1981) or more subsequent years (Sands, Sarno, and Shankweiler, 1969; Broida, 1977; Aten, Caligiuri, and Holland, 1982; Hanson, Metter, and Riege, 1985).

Very few studies have investigated the recovery patterns of treated patients with different types of aphasia. Ludlow (1977) found differences in the pattern of improvement between fluent and nonfluent patients during the first three months postonset of stroke. Her

results indicated that fluent patients show the greatest amount of language improvement during the second month postonset. Nonfluent patients showed a steady, continuous improvement across the first three months postonset. Other investigators have found that nonfluent patients recover better with treatment than fluent patients (Butfield and Zangwill, 1946; Godfrey and Douglas, 1959; Basso, Capitani, and Vignolo, 1979). Unfortunately, these studies did not specify the amount or type of treatment given.

In addition to the different treatment recovery patterns evident with different types of aphasia, different language skills appear to be differentially affected by treatment. Whereas speech repetition (Ludlow, 1977) or verbal naming (Kenin and Swisher, 1972; Ludlow, 1977) appear to improve with treatment, expressive language at the utterance or clausal level does not appear to improve significantly with treatment (Kenin and Swisher, 1972; Hagan, 1973; Prins, et al., 1978). Again, the amount and type of treatment in each of these studies was not specified.

The Study of Treatment Effectiveness

Two different approaches have been utilized to determine the effects of treatment on aphasia. A number

of studies have been conducted to determine the efficacy of treatment in improving gains over those of spontaneous recovery by comparing treated and untreated subjects. The majority of these studies support the effectivenss of treatment (Hagen, 1973; Basso, Capitani, and Vignolo, 1979; Shewan and Kertesz, 1984; Wertz, et al., 1986).

An area of research that has received much less attention involves the comparison of different treatments. These studies seek to compare the effectiveness of one type of treatment with the effectiveness of another (Sarno, Silverman, and Sands, 1970; Wertz, et al., 1981; Shewan and Kertesz, 1984; Hartman and Landau, 1987) or to compare treatment provided by speech pathologists with untrained (David, 1982) or trained volunteers (Meikle, et al., 1979; Quinteros, Williams, White, and Pickering, 1984; Shewan and Kertesz, 1984; Wertz, et al., 1986). These studies show few differences between treatments.

The first study to compare treatments was the one conducted by Sarno, Silverman, and Sands (1970). They investigated the effectiveness of treatment in severe aphasia and compared the effectiveness of nonprogrammed and programmed instruction on language improvement. All patients were at least 18 years old, premorbidly right handed, and had sustained a CVA with right hemiplegia.

All patients scored below 31% on the Functional Communication Profile. Thirty-one patients were divided into three groups. The first group received programmed instruction treatment. Treatment was designed on the basis of a "presumed hierarchy" of skills thought to represent the reacquisition of skills in the recovery of language. The second group received nonprogrammed treatment. This treatment consisted of a list of vocabulary words to be taught in the modalities of auditory comprehension, imitation, and oral production. The vocabulary items were the same for each treatment. Group 3 was a no-treatment control group. The treatment groups received treatment for a maximum of 80 half-hour sessions or until all of the treatment was completed. Treatment ranged from 4 to 36 weeks. Results indicated significant improvement on two of the 10 terminal behaviors when comparing the nonprogrammed treatment group with the no-treatment control group, but overall improvement among groups did not differ significantly.

Four studies have assessed the effectiveness of treatment provided by speech pathologists and that provided by trained volunteers. Meikle, Wechsler, Tupper, Bennenson, Butler, Mulhall, and Stern (1979) found that the two forms of treatment were essentially equivalent. Thirty-one patients were assigned randomly to the two treatment groups. Treatment began at least

three weeks postonset and evaluations were done at entry and at six weekly intervals with the PICA. Treatment continued until two successive PICA measures showed no improvement, patients withdrew, or the study ended. Patients received between three and five sessions weekly.

Quinteros et al. (1984) also compared treatment results obtained by speech pathologists and trained volunteers. Twenty-four aphasic subjects were assigned to two groups based on availability of volunteers. All patients were evaluated with the Boston Diagnostic Examination of Aphasia at entry and six months later. The Functional Communication Profile was administered at entry and at three monthly intervals. Total amount of treatment differed for the two groups. Volunteer treatment patients received more therapy than the speech pathology treatment patients. The results indicated that patients who received volunteer treatment made greater progress. However, the confounding effect of more treatment for this group makes the results difficult to interpret.

Shewan and Kertesz (1984) investigated the effectiveness of four different treatment conditions: language-oriented treatment, stimulation-facilitation treatment, trained volunteer-administered treatment, and no-treatment. Amount of treatment varied among patients

and groups. Results, based on the Western Aphasia Battery and a test for auditory comprehension, indicated that treatment provided by speech pathologists (language-oriented and stimulation-facilitation) was significantly better than no-treatment. However, treatment provided by volunteers did not differ significantly from no-treatment. In addition, comparisons among language-oriented, stimulation-facilitation, and volunteer-administered treatments were not significantly different.

Wertz, et al. (1986), in the second VA cooperative study, compared treatment administered by speech pathologists, trained volunteers, and deferred treatment. Patients were assigned randomly to one of the three groups. Each group received 12 weeks of treatment. The PICA was used as a measure of initial language severity and as the primary measure of improvement. Individual treatment was delivered in, primarily, stimulus-response paradigms designed to improve language deficits in auditory comprehension, reading, oral-expressive language, and writing. Ninety-four patients completed the study. Results indicated that the volunteer treatment group improved more than the untreated (deferred) patients but less than the group who received treatment from speech pathologists. However, only the speech pathology group

differed significantly from the no-treatment group.

David, Enderby, and Bainton (1982) compared treatment administered by speech pathologists and untrained volunteers. All patients who had been referred for speech therapy and were predominantly aphasic were eligible for the study. Patients entered the study at least three weeks postonset and were assigned randomly to one of the two treatment groups. The patients received 30 hours of treatment over a 15-20 week period. Assessment with the Functional Communication Profile was done at entry, 2, 4, 8, and 12 weeks after entry, and at the end of treatment. They found that the patients in each group improved, but there were no significant differences between the two groups.

Hartman and Landau (1987) compared task-oriented aphasia therapy and nondirective counseling/conversation treatment. Both treatments were provided by speech pathologists. Sixty of the patients who were assigned to treatment groups based on a predetermined block of ten patients--five for each treatment--completed the study. Treatment was administered twice weekly for six months. The PICA was used to test for group differences. Results indicated no significant differences between the two treatments.

The most comprehensive comparison of different

treatments was the study conducted by Wertz et al. (1981). Sixty-seven subjects were assigned randomly to either an individual, stimulus-response type of treatment or to group treatment. Both treatments were conducted by speech pathologists. The length of the study was 44 weeks. Due to the high attrition rate, the data were fractionated into cohorts of 15, 26, 37, and 48 weeks. An extensive battery of measures was administered at entry (four weeks postonset), 15, 26, 37, and 48 weeks postonset or until a patient dropped out of the study. The battery included: neurologic examination, sensory screening, PICA, Token Test, Word Fluency Measure, motor speech evaluation, Coloured Progressive Matrices, Conversational Rating, and an Informant's Rating of functional language use adapted from Sarno (1969). Each patient received 8 hours of treatment each week. Group A, individual treatment, received traditional, stimulus-response language treatment. Group B, group treatment, received a nondirective, social treatment in groups of three to seven patients. Both treatment groups improved significantly on all measures. Individual treatment resulted in more improvement than group treatment. However, only the PICA Overall percentile in the 26 and 37 week cohorts, the PICA Verbal percentile in the 15 and 26 week cohorts and the PICA Graphic percentile in

all cohorts indicated significant differences between the groups. Both groups continued to improve significantly beyond six months postonset, the assumed period of spontaneous recovery. This implies that treatment was effective for the patients treated in both groups for nine to 12 months.

Although these investigations obtained similar results, there were important differences among them. Subject selection criteria was lax in some studies. Selection was based on "representative" samples of hospital referrals for two studies (David, et al., 1982; Hartman and Landau, 1987). Mixed etiologies, including both thromboembolic and hemorrhagic or unspecified, were included in other studies (Quinteros, et al., 1984; Shewan and Kertesz, 1984; Meikle, et al., 1979). Only two studies used rigid selection criteria to control variables that may influence response to treatment (Wertz, et al., 1981; Wertz, et al., 1986).

The studies also differed in the method for group assignment. Random assignment of patients that equates groups on a number of variables occurred in six studies (Meikle, et al., 1979; Wertz, et al., 1981; David et al., 1982; Shewan and Kertesz, 1984; Wertz, et al., 1986; Hartment and Landau, 1987). However, nonrandom assignment of patients to treatment conditions was used in the other studies (Sarno et al., 1970; Quinteros, et

al., 1984).

The duration and amount of treatment differed markedly among studies. In some, not all patients received the prescribed amount of treatment (Meikle, et al., 1979; David, et al., 1982; Quinteros, et al., 1984; Shewan and Kertesz, 1984; Hartman and Landau, 1987) or were treated until criterion for a specific language goal was met (Sarno, et al., 1970). Patients who did not receive the prescribed amount of treatment in both of the Wertz et al. studies were considered dropouts.

The measures of treatment effectiveness also differed among studies. The Functional Communication Profile (Sarno, 1969), a measure of a patient's prestroke language abilities, was used in two studies (Sarno, et al., 1970; David, 1982). The Western Aphasia Battery (Kertesz, 1982) and the ACTS (Shewan, 1979) was used in the Shewan and Kertesz study (1984). The Porch Index of Communicative Abilities (PICA) (Porch, 1967) was used in four studies (Meikle, et al., 1979; Wertz, et al., 1981; Wertz, et al., 1986; Hartman and Landau, 1987). The Boston Diagnostic Examination of Aphasia was used by Quinteros, et al., 1984 and Wertz, et al. (1986). And, Wertz, et al. (1981, 1986) used additional standardized and functional measures.

Except for Wertz et al. (1981), most investigations indicate different treatments for aphasia do not differ

significantly in their efficacy. However, these results are based upon studies that are not directly comparable and the use of measures that may not detect specific changes in language.

CHAPTER 3

Methodology

Introduction

This investigation was a retrospective study of language change in aphasic patients who were treated during the first year postonset. The data come from videotaped language samples of patients who participated in the Wertz, et al. (1981) investigation. First, the original study will be summarized, and then the methodology for the present study will be presented.

Summary of the Wertz, et al. (1981) Study

Selection Criteria. Patients in the V. A. Cooperative Study were required to meet the following selection criteria (p. 581): status, veteran; sex, male; age, 40-80 years; education, premorbid ability to read and write English; etiology, first thromboembolic CVA; localization, damage confined to the left hemisphere; medical status, no major coexisting medical problem; sensory and motor status, auditory acuity no worse than a 40-dB speech reception threshold in the poorer ear, visual acuity no worse than 20/100 corrected in the poorer eye, and tactile function demonstrated by

adequate sensory and motor ability in one hand to write and gesture; time postonset, four weeks at entry; and language severity, 15th-75th overall percentile performance on the Porch Index of Communicative Ability (PICA; Porch, 1967) at entry.

Study Patients. Patients who met selection criteria were assigned randomly to either individual treatment or group treatment. Thirty-four of 67 patients who entered the study completed 44 weeks of treatment. All subjects were evaluated with a battery of measures at 4, 15, 26, 37, and 48 weeks postonset, and all evaluations were videotaped.

Treatment. All subjects who completed the study received eight hours of treatment each week for 44 weeks. Individual treatment by a speech pathologist consisted of four hours of stimulus-response type of treatment designed to improve language in all communicative modalities and four hours of machine-assisted treatment. Group treatment was conducted by a speech pathologist in groups of three to seven patients four hours each week. Treatment was designed to facilitate language use in a social setting, but there was no direct manipulation of speech or language deficits. Group treatment was supplemented by group recreational activities four hours each week.

Evaluations. A battery of measures was presented

at entry and every 11 weeks thereafter up to 48 weeks postonset. All measures were videotaped. Two of these, a sample of conversation and PICA subtest I, provided the data for the present study.

The conversational samples were collected in an attempt to measure functional language in conversation when the subject was unaware of being evaluated. A speech-language pathologist was instructed to converse with the patient about his current status, health, living environment, communicative ability, and events in his life during the past week.

PICA subtest I was administered according to standard procedures as part of the 18-subtest PICA. Subtest I is designed to obtain "complete, spontaneous sentences or groups of sentences about the function of test objects. It samples the patient's running speed, his ability to use grammar and syntax, and his general verbal intelligibility" (p. 27, Porch, 1967). The test objects are: cigarette, comb, fork, key, knife, matches, pen, pencil, quarter, and toothbrush.

Present Study

Subjects

Three criteria were used to select subjects from the 34 patients who completed the Wertz, et al. (1981)

investigation. First, videotapes containing the conversational sample and PICA subtest I had to be available for the 4, 15, 26, 37, and 48 week evaluations. Second, the sample was selected to include an equal number of fluent and nonfluent patients. And, third, the sample was selected to include an equal number of patients in each of the two treatment groups, individual and group. Twenty subjects who satisfied these criteria were selected. Age at four weeks postonset, education, type of treatment received, type of aphasia, and PICA overall percentile performance at four weeks postonset, for all subjects are shown in Table 1. Descriptive data for the subjects divided into fluent and nonfluent groups and individual and group treatment groups are shown in Tables 2 and 3.

Instruments: Specific Language Measures

Syntactic and semantic aspects of language were measured within a T-unit framework. The pragmatic aspects of language were measured by the Pragmatic Protocol.

Syntactic Analysis. The T-unit analysis provides a measure of syntactic complexity. A T-unit is defined as one main clause with all of the subordinate clauses or nonclausal structures attached to it (Hunt, 1965 and 1970). According to Hunt (1970), a T-unit, or "minimal

Table 1. Descriptive data at 4 weeks postonset for age, education, and language severity for each subject.

Subject	Age (years)	Education (years)	PICA Overall Score	Treatment	Aphasia
1	73	16	43	Individual	Nonfluent
2	63	9	72	Group	Fluent
3	58	6	50	Group	Fluent
4	65	8	42	Individual	Nonfluent
5	45	12	15	Group	Nonfluent
6	57	12.5	16	Individual	Nonfluent
7	63	8	60	Individual	Fluent
8	78	8	66	Group	Fluent
9	41	12	73	Individual	Fluent
10	51	12	44	Group	Fluent
11	68	10	49	Group	Fluent
12	65	8	55	Individual	Nonfluent
13	62	9	58	Individual	Fluent
14	50	12	49	Group	Fluent
15	64	6	35	Individual	Nonfluent
16	55	7	39	Group	Nonfluent
17	78	3	26	Group	Fluent
18	52	13	47	Individual	Nonfluent
19	52	12	15	Individual	Nonfluent
20	61	12	19	Group	Nonfluent

Table 2. Descriptive data at 4 weeks postonset for age, education, and language severity for each aphasia group.

Variable	Fluent (N=10)	Nonfluent (N=10)
Age in years		
Mean	61.20	58.90
Standard Deviation	11.25	7.82
Range	41-78	45-73
Education in years		
Mean	8.90	10.65
Standard Deviation	2.74	3.03
Range	3-12	6-16
PICA Overall Percentile		
Mean	54.70	32.60
Standard Deviation	14.24	15.03
Range	26-78	15-55

Table 3. Descriptive data at 4 weeks postonset for age, education, and language severity for each treatment group.

Variable	Individual (N=10)	Group (N=10)
Age in years		
Mean	59.40	60.70
Standard Deviation	8.62	10.73
Range	41-73	45-78
Education in years		
Mean	10.45	9.10
Standard Deviation	2.94	2.95
Range	6-16	3-12
PICA Overall Percentile		
Mean	42.90	44.40
Standard Deviation	18.73	18.66
Range	15-73	15-72

terminable unit," segments a passage of speech "into the shortest units which it is grammatically allowable to punctuate as sentences" (p. 4). A sample provided by Hunt (1965) to illustrate how to segment a passage into T-units is located in Appendix A.

Modification of the T-unit Analysis: Three measures, defined by Hunt, were used to assess the syntactic aspects of language. These measures are clauses in each T-unit, words in each T-unit, and words in each clause. For the purposes of this study, five modifications of the T-unit analysis were made in order A. to define and identify clausal units more adequately, B. to account for specific language deficits in aphasic speech, C. to account for conversational turn-taking, D. to specify lexical units, and E. to account for syntactic accuracy. Each modification will be discussed separately.

Clausal Definition and Identification

A Grammar of Contemporary English (Quirk, Greenbaum, Leech, and Svartvik, 1972) served as the definitive bases for the T-unit analysis in order to establish consistency across clause level analyses. This book was also used by Crystal, Fletcher, and Garman (1976) in devising the LARSP.

According to Quirk, et al., a clause is defined as

"a unit that can be analyzed into the elements Subject, Verb, Complement, Object, and Adverbial" (p. 342). Clauses are also the constituent parts of sentences with a simple sentence containing just one clause and a complex sentence containing more than one clause.

The T-unit is defined with terms "main clause," "subordinate clause," and "nonclausal structures." Quirk et al. define a main clause as follows:

> if there are two clauses in a sentence and one is subordinate, the superordinate clause is the main clause. If two or more independent clauses are coordinated together, then each one is a main clause (p. 721).

A main clause must also contain a finite verb. A finite verb is characterized by tense, person and number concord between the subject and the finite verb, and indicates the speaker's attitude to the predication.

A subordinate clause is defined, for the purposes of this study, as any clause other than main clause. Subordinate clauses can be identified according to structural type, functional classification, or formal indicators. Structurally, subordinate clauses can be identified by nonfinite verb phrases. A nonfinite verb phrase is characterized by no tense distinction, cannot contain modals, and cannot occur in imperatives.

Functional identification of a subordinate clause is based on its role in a superordinate or main clause. A subordinate clause can function as: a subject,

object, complement, or adverbial.

Formal indicators of subordination are marked by a signal found in the subordinate clause rather than the superordinate or main clause. For example, "that," "because," "since," and "while" can be indicators of subordinate clauses. A list of subordinators, provided by Quirk et al., is located in Appendix B.

Nonclausal structures that are included in a T-unit analysis are prepositional phrases or elliptical structures that cannot be recovered from the context.

Special Considerations of Spontaneous and Disordered Language

Language production of aphasic patients has been characterized by paraphasias, word omissions, syntactic errors, and revisions. In order to measure aphasic language with the T-unit analysis, the following guidelines were developed for this study.

1. topicalization: introduces or clarifies the topic of a T-unit or clause. The topic word(s) is considered nonclausal and is attached to the adjoining appropriate clause. It is counted in the word tally. E.g.

a fork you eat with it
topic

Analysis: 1 T-unit, 1 clause, 6 words

this is/to brush your teeth with the toothbrush
topic

Analysis: 1 T-unit, 2 clauses, 9 words

2. Omissions: obligatory constituents omitted from a T-unit or clause. The omitted items are not counted in the word tally. The clause or T-unit must have a verb or implied predication. E. g.

* cigarette is / to smoke

Analysis: 1 T-unit, 2 clauses, 4 words

* is / to comb

Analysis: 1 T-unit, 2 clauses, 3 words
(Note: * indicates missing constituent(s))

3. Incomplete: The patient stops before a sentence or clause is completed. A separate clause is counted only if a verb is present or if predication is implied, otherwise, the words are counted as nonclausal and are attached to the adjoining appropriate clause. E. g.

but I have things / that upset me that uh uh

Analysis: 1 T-unit, 2 clauses, 8 words

4. Revisions

a. revisions that add information are tallied in the T-unit analysis. E. g.

I went to St. Francis' bowl no not a bowl

Analysis: 1 T-unit, 1 clause, 9 words
(Note: "St. Francis'" counted as 1 word)

b. revisions and/or self-corrections that exchange a verbalization, word, or phrase for another verbalization, word, or phrase are not tallied in the T-unit analysis. E.g.

it's the first time / since last week I had a went bike riding

Analysis: 1 T-unit, 2 clauses, 12 words
(Note: "had a" not counted)

5. Repetitions: verbalizations, words, or

phrases that are repeated and do not add information are not tallied. E.g.

I went to uh went to uh to uh uh my sister's

Analysis: 1 T-unit, 1 clause, 5 words
(Note: "uh went to uh to uh uh" not counted)

6. Parentheical Verbs/Automatic Utterances: these structures if found at the beginning, within, or end of utterances were not counted as separate clauses, but were counted in the word tally. If one of these structures occurred alone, it was counted as 1 T-unit, 1 clause, plus the appropriate number of words. Examples of parentheical verbs and automatic utterances include: "see," "I guess," "you know," "let's see," "I mean."
E.g.

it's not right but you know

Analysis: 1 T-unit, 1 clause, 7 words
(Note: "it's" counted as two words)

for my life see I guess I read about two or three books in my whole life time

Analysis: 1 T-unit, 1 clause, 18 words

7. Unintelligible Utterances: unintelligible utterances were enclosed within slashes (/ /) on each transcription. T-units containing unintelligible utterances were generally not analyzed. T-units with unintelligible utterances were analyzed if the questionable utterance was a proper name or a number. The unintelligible proper name or number was tallied in the word count. E.g.

I was born in /Keesville/

Analysis: 1 T-unit, 1 clause, 5 words

I got married in nineteen forty-/?/

Analysis: 1 T-unit, 1 clause, 5 words
(Note: "nineteen forty-/?/" counted as 1 word)

Conversational Turn-Taking

Sentence relations that extended across utterance boundaries, either in the same speaker or a different speaker were included in the T-unit analysis if a connective form or subordinator was used (Bloom, Lahey, Hood, Lifter, and Fiess, 1980). E.g.

Patient: I may not come /
Clinician: oh?
Patient: if my wife is sick

Analysis: 1 T-unit, 2 clauses, 9 words

Lexical Units

Contracted verbs, such as it's or they're, were counted as two words. Dialectical pronounciations such as wanna for want to or gonna for going to were counted as two words. Proper names or numbers, such as Mississippi River or ninety-two, were counted as one word. Variations in word productions that maintained the integrity of the word were counted in the word tally. For example, "toppee" for "coffee."

Syntactic Well-formedness. Each T-unit was judged qualitatively for syntactic accuracy. The criteria for judgment were based on descriptions of syntactic impairment in aphasic patients found in the literature. A T-unit that was syntactically accurate was given a "+" rating. Any syntactic violation received a "-" rating. Syntactic violations included: verb tense/concord errors, obligatory word omissions, addition of extra elements, incomplete, plural errors, pronoun errors,

word order errors, and awkward syntax. Examples of syntactic errors are located in Appendix C. A syntactic accuracy score was computed through the formula:

number of "+" ratings divided by
the sum of "+" and "-" ratings

Semantic Accuracy. Semantic accuracy judgments were made for each T-unit. These judgments were intended to document semantic changes that may occur independent of syntactic changes. For example, the spontaneous oral-expressive language of some fluent aphasic patients has been described as syntactically complex but empty of content. T-unit utterances that contained vague/empty vocabulary, errors in given/new information, excessive semantic or neologistic paraphasias, inaccurate information, ambiguous/empty content, or incomplete content received a "-" rating (Appendix D). All other T-unit utterances received a "+" rating. The semantic accuracy score was computed by the following formula:

number of "+" ratings divided by
the sum of "+" and "-" ratings

PICA. The PICA overall score for each patient at each time period was obtained from the Wertz, et al. (1981) data.

Pragmatic Analysis. The pragmatic protocol (Prutting and Kirchner, 1983, 1987) assesses verbal,

paralinguistic, and nonverbal aspects of language use and is designed to screen overall communicative abilities. An earlier version was based on Searle's Speech Act Theory (Searle, 1969 as reported in Prutting and Kirchner, 1983), but has been revised to to include Levinson's (1983) concepts of the interrelatedness of language structure and language use. The pragmatic protocol consists of 30 pragmatic aspects of language that were extrapolated from normative data on children and adults. For the purposes of this study, the category of stylistic variations was omitted from the ratings because it requires observations beyond the scope of the data. Definitions of each of the 29 observable pragmatic behaviors are in Appendix E.

According to Prutting and Kirchner (1987), the pragmatic protocol rating should be completed after viewing an unstructured, spontaneous conversational interaction between the patient and his partner. Each of the 30 behaviors are scored as appropriate, inappropriate, or no opportunity to observe. Definitions for scoring are (Prutting and Kirchner, 1987, p. 108):

> Appropriate: Behaviors are marked appropriate if they facilitate the communicative interaction or are neutral.
>
> Inappropriate: Behaviors are judged inappropriate if they detract from the

communicative exchange and penalize the individual.

No Opportunity to Observe: When the evaluator does not have sufficient information to judge the behavior as appropriate or inappropriate the clinician marks this column.

Procedures

Prior to the beginning of the study, the 100 subject videotapes, five for each of the 20 subjects, were randomized and coded by number to control for any bias from knowing the time postonset. All videotaped conversations and PICA subtest I performances were then transcribed orthographically into conventional English spelling by the investigator or another speech-language pathologist. All intelligible verbalizations of both the clinicians and the subjects were transcribed. Transcription notations (Appendix F) were used to document instances of unintelligible verbalizations, interruptions, overlaps, excessive pausing, and nonverbal gestures.

Each conversation and PICA subtest I performance was timed with a stopwatch. Conversation timing began when the first word was spoken and ended when the clinician concluded the conversation by a remark similar to "okay, I think it's time to get started" or "why don't we get started." The first word of this type of

sequence ("okay" or "why") was considered the end of the conversation and timing stopped. PICA subtest I timing began with the subject's first word or verbalization following completion of the test instructions. Timing stopped with the subject's last word on the final object.

The T-unit analysis, syntactic well-formedness judgements, and the semantic accuracy judgements were carried out on both the conversations and PICA Subtest I language transcriptions. For each transcript, the T-units were identified and written on a worksheet. Following the identification of T-units, the number of clauses and words for each T-unit was determined. Syntactic and semantic accuracy judgements were made following the T-unit analysis.

Prior to the pragmatic analysis, the investigator received pretraining for the use of the pragmatic protocol from the first author of the pragmatic protocol. Pretraining included discussions of the behavioral definitions and practice scoring of videotapes of patients with a variety of disorders. The criterion for pretraining ratings was 90% accuracy. The pragmatic protocols were completed either during or after viewing the conversation on videotape, and viewing was repeated if necessary. A pragmatic protocol for each conversation was completed for all 100

conversations, five for each of the 20 subjects.

Reliability

Language Transcriptions. Five percent of the videotapes were selected randomly to determine point-to-point word interjudge and intrajudge reliabilities. Interjudge reliability was 95% and intrajudge reliability was 94%.

Language Analyses. Data from ten percent of the subjects were scored to determine point-to-point word, T-unit, and clause interjudge and intrajudge reliability for the T-unit analysis; point-to-point plus/minus judgments for the syntactic and semantic analyses; and point-to-point pragmatic ratings. Interjudge reliability for the T-unit analysis was 94%, and intrajudge reliability was 96%. Interjudge reliability for the syntactic and semantic accuracy for each T-unit was 85% and 87%, respectively, and intrajudge reliability was 89% and 93%, respectively. Interjudge reliability for the pragmatic ratings was 94%. Intrajudge reliability was 96%.

PICA Scores. From the original study, there was 95% interjudge agreement on the PICA overall scores.

Aphasia Type. Fluent and nonfluent classifications were determined by methods employed by the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan,

1972) and the Western Aphasia Battery (Kertesz, 1982). Interjudge reliability was 95% (Wertz, Kitselman, and Deal, 1981).

Statistical Analysis

The data were analyzed by 2 (time) x 2 (aphasia type) x 2 (treatment group) analyses of variance with repeated measures over time. Time was 4 and 15 weeks. Type was fluent and nonfluent. Treatment was individual and group. Repeated measures 4 (time) x 2 (aphasia type) x 2 (treatment group) analyses of covariance with contrasts were also used. Language scores at 4 weeks postonset served as the covariant. Time was 15, 26, 37, and 48 weeks. Type was fluent and nonfluent. Treatment was individual and group.

CHAPTER 4

Results

Performance on each language measure for all subjects combined is shown in Table 4. Performance for the subjects divided into fluent and nonfluent groups is shown in Table 5. And, performance for the subjects divided into individual and group treatment groups is shown in Table 6. Inspection of the means in Table 4 indicates a general increase in subjects' performance on most measures over time. In Table 5, mean performance was, generally, better for the fluent group than the nonfluent group at all time periods. Mean performance for the individual and group treatment groups, Table 6, showed, generally, improved performance on most measures over time, and the groups differed in their performance among measures.

Preliminary 2 (sample) x 5 (time) repeated measures analyses of variance were performed on each of the syntactic and semantic language measures to test for differences in sample source, PICA Subtest I and conversation, and the effect of the sample source within each of the five time periods--4, 15, 26, 37, and 48 weeks postonset. The results of these analyses are summarized in Table 7. Significant main effects were found between sample sources on Words per Clause

Table 4. Means, standard deviations, and range for each measure over time for all subjects.

Source	Mean	Standard Deviation	Range
Standardized Test Performance			
PICA Overall Score			
4 Weeks	43.65	18.21	15-73
15 Weeks	62.00	21.23	15-90
26 Weeks	64.70	19.92	13-90
37 Weeks	67.60	19.04	20-93
48 Weeks	69.20	18.26	32-95
Syntactic Measures			
Clauses/T-Unit			
Conversation:			
4 Weeks	1.16	.47	0-2
15 Weeks	1.35	.24	1-2
26 Weeks	1.22	.36	0-2
37 Weeks	1.29	.45	0-2
48 Weeks	1.36	.28	1-2
PICA Subtest I:			
4 Weeks	1.20	.37	0-2
15 Weeks	1.28	.32	1-2
26 Weeks	1.22	.48	0-2
37 Weeks	1.24	.42	0-2
48 Weeks	1.21	.45	0-3
Words/Clause			
Conversation:			
4 Weeks	4.45	1.91	0-7
15 Weeks	4.97	1.40	1-7
26 Weeks	5.08	1.67	0-7
37 Weeks	5.10	1.53	0-8
48 Weeks	4.98	1.37	1-6
PICA Subtest I:			
4 Weeks	4.07	1.63	0-6
15 Weeks	4.30	1.09	1-7
26 Weeks	4.21	1.92	0-9
37 Weeks	4.38	1.64	0-7
48 Weeks	4.65	1.78	0-8

Table 4, Continued. Means, standard deviations, and range for each measure over time for all subjects.

Source	Mean	Standard Deviation	Range
Words/T-Unit:			
Conversation			
4 Weeks	5.82	2.99	0-11
15 Weeks	6.89	2.45	1-10
26 Weeks	6.58	2.50	0-10
37 Weeks	6.95	2.65	0-11
48 Weeks	6.91	2.48	1-11
Words/T-Unit:			
PICA Subtest I			
4 Weeks	5.32	2.61	0-9
15 Weeks	5.57	2.06	1-10
26 Weeks	5.60	2.41	0-9
37 Weeks	5.72	2.51	0-11
48 Weeks	5.88	2.53	0-12
Syntactic Well-Formedness:			
Conversation			
4 Weeks	66.41	18.43	30-100
15 Weeks	59.95	25.84	0-100
26 Weeks	69.66	21.49	0-100
37 Weeks	66.72	18.85	14- 95
48 Weeks	66.38	21.45	0-100
PICA Subtest I			
4 Weeks	57.65	28.85	0-100
15 Weeks	66.05	23.88	0-100
26 Weeks	67.99	19.06	27-100
37 Weeks	73.66	23.09	0-100
48 Weeks	70.44	19.99	20-100
	Semantic Measure		
Semantic Accuracy:			
Converation			
4 Weeks	69.90	28.82	0-100
15 Weeks	69.76	30.51	0-100
26 Weeks	78.46	27.92	0-100
37 Weeks	81.43	21.78	14-100
48 Weeks	82.42	21.51	25-100

Table 4, Continued. Means, standard deviations, and range for each measure over time for all subjects.

Source	Mean	Standard Deviation	Range
	Semantic Measure, Continued		
Semantic Accuracy:			
PICA Subtest I			
4 Weeks	50.03	30.30	0- 93
15 Weeks	74.88	27.24	0-100
26 Weeks	77.09	21.53	0-100
37 Weeks	79.80	24.18	0-100
48 Weeks	79.60	22.95	0-100
	Pragmatic Measure		
Pragmatics Appropriateness:			
4 Weeks	87.45	5.93	72- 97
15 Weeks	91.15	5.95	77- 97
26 Weeks	91.35	5.16	79- 97
37 Weeks	92.25	5.66	79-100
48 Weeks	92.90	5.59	83-100

Table 5. Means, standard deviations, and range for each measure over time for fluent (F) and nonfluent (NF) groups.

Measure	Fluent				Nonfluent			
	Mean	SD	n	Range	Mean	SD	n	Range
Standardized Test Measure								
PICA Overall Score:								
4 Weeks	54.70	14.24	10	26–73	32.60	15.03	10	15–55
15 Weeks	73.70	15.34	10	44–90	50.30	20.29	10	15–88
26 Weeks	73.80	14.99	10	43–90	55.60	20.72	10	13–89
37 Weeks	75.00	15.22	10	43–91	60.20	20.30	10	20–93
48 Weeks	76.50	16.60	10	42–95	61.90	17.62	10	32–92
Syntactic Measures								
Clauses/T-Unit:								
Conversation								
4 Weeks	1.43	.24	10	1.00–1.89	.88	.49	10	0–1.50
15 Weeks	1.54	.18	10	1.21–1.80	1.16	.12	10	1.00–1.36
26 Weeks	1.35	.20	10	1.00–1.66	1.08	.44	10	0–1.77
37 Weeks	1.52	.31	10	1.28–2.29	1.06	.46	10	0–1.86
48 Weeks	1.51	.28	10	1.12–1.91	1.21	.20	10	1.00–1.57
PICA Subtest I								
4 Weeks	1.36	.23	10	1.07–1.68	1.04	.42	10	0–1.20
15 Weeks	1.35	.31	10	1.00–2.04	1.22	.34	10	1.00–2.10
26 Weeks	1.30	.22	10	1.00–1.65	1.14	.65	10	0–1.90
37 Weeks	1.37	.30	10	1.00–2.09	1.10	.49	10	0–2.00
48 Weeks	1.30	.46	10	1.00–2.50	1.12	.45	10	0–1.57
Words/Clause:								
Conversation								
4 Weeks	5.73	.98	10	4.75–7.48	3.17	1.76	10	0–5.10
15 Weeks	5.60	.63	10	4.58–6.77	4.35	1.69	10	1.00–6.47
26 Weeks	5.77	.52	10	4.77–6.38	4.39	2.14	10	0–6.53
37 Weeks	5.56	.64	10	4.71–7.50	4.64	2.01	10	0–7.50
48 Weeks	5.44	.77	10	4.00–6.44	4.53	1.70	10	1.00–6.03
PICA Subtest I								
4 Weeks	5.10	.73	10	3.72–6.13	3.04	1.65	10	0–5.52
15 Weeks	4.67	.94	10	2.69–6.50	3.93	1.15	10	1.00–5.18
26 Weeks	5.19	1.57	10	2.64–8.50	3.22	1.77	10	0–4.67
37 Weeks	5.04	1.08	10	3.00–6.55	3.72	1.89	10	0–6.10
48 Weeks	5.34	1.45	10	3.33–7.82	3.96	1.88	10	0–6.36

Table 5, Continued. Means, standard deviations, and range for each measure over time for fluent (F) and nonfluent (NF) groups.

Measure	Fluent				Nonfluent			
	Mean	SD	n	Range	Mean	SD	n	Range
Syntactic Measures, continued								
Words/T-Unit:								
Conversation								
4 Weeks	8.17	1.66	10	6.03-10.61	3.48	1.99	10	0- 5.67
15 Weeks	8.57	1.06	10	6.94- 9.90	5.21	2.30	10	1.00- 8.46
26 Weeks	7.77	1.18	10	6.33- 9.37	5.38	2.93	10	0- 9.59
37 Weeks	8.39	1.52	10	6.08-10.86	5.51	2.81	10	0-10.27
48 Weeks	8.17	1.82	10	4.80-11.25	5.65	2.48	10	1.00- 9.21
PICA Subtest I								
4 Weeks	6.95	1.53	10	4.90- 9.35	3.68	2.46	10	0-7.67
15 Weeks	6.28	1.81	10	3.50-10.00	4.87	2.15	10	1.00-9.40
26 Weeks	6.63	1.72	10	2.90- 8.63	4.57	2.63	10	0-8.00
37 Weeks	6.82	1.87	10	5.13-10.91	4.62	2.67	10	0-8.64
48 Weeks	6.83	2.46	10	4.53-12.08	4.92	2.33	10	0-7.00
Syntactic Well-Formedness:								
Conversation								
4 Weeks	67.79	11.11	10	56- 93	59.64	21.43	7	30- 88
15 Weeks	67.52	12.47	10	40- 78	52.59	21.64	7	35-100
26 Weeks	75.26	13.07	10	51-100	69.66	15.42	7	43- 86
37 Weeks	72.83	14.81	10	45- 96	62.77	23.73	7	14- 83
48 Weeks	69.79	11.12	10	50- 83	73.77	15.51	7	53-100
PICA Subtest I								
4 Weeks	65.58	17.53	10	43- 93	54.95	34.23	8	0-100
15 Weeks	69.35	17.41	10	39- 95	65.94	18.85	8	41- 95
26 Weeks	74.51	10.45	10	57- 95	59.85	24.60	8	27-100
37 Weeks	83.50	11.61	10	64-100	70.56	16.54	8	53-100
48 Weeks	75.85	11.20	10	58- 92	69.98	21.48	8	43-100
Semantic Measure								
Semantic Accuracy:								
Conversation								
4 Weeks	71.82	23.57	10	31-100	62.86	36.13	7	0-100
15 Weeks	80.73	14.30	10	51-100	69.71	25.81	7	24-100
26 Weeks	87.12	10.75	10	64-100	74.23	30.27	7	10-100
37 Weeks	81.57	12.67	10	65-100	83.07	30.93	7	14-100
48 Weeks	89.25	12.05	10	63-100	77.53	26.22	7	25-100

Table 5, Continued. Means, standard deviations, and range for each measure over time for fluent (F) and nonfluent (NF) groups.

Measure	Fluent				Nonfluent			
	Mean	SD	n	Range	Mean	SD	n	Range
				Semantic Measure, continued				
Semantic Accuracy:								
PICA Subtest I								
4 Weeks	57.09	25.24	10	17- 93	47.46	33.25	8	0- 82
15 Weeks	83.52	11.96	10	66-100	76.55	28.82	8	9-100
26 Weeks	81.73	10.37	10	67-100	71.29	30.31	8	0- 91
37 Weeks	89.26	9.84	10	73-100	65.45	30.94	8	0-100
48 Weeks	88.75	8.39	10	73-100	70.63	31.57	8	0-100
				Pragmatic Measure				
Pragmatic Appropriateness:								
Conversation								
4 Weeks	89.70	4.37	10	83- 97	85.20	6.63	10	72- 93
15 Weeks	93.20	2.35	10	90- 97	89.10	7.74	10	76- 97
26 Weeks	92.90	3.57	10	86- 97	89.80	6.18	10	79- 97
37 Weeks	94.40	4.25	10	90-100	90.10	6.26	10	79-100
48 Weeks	95.40	4.27	10	90-100	90.40	5.82	10	83-100

Table 6. Means, standard deviations, and range for each measure over time for individual and group treatment groups.

Measure	Individual				Group			
	Mean	SD	n	Range	Mean	SD	n	Range
Standardized Test Measure								
PICA Overall Score:								
4 Weeks	44.40	18.66	10	15–72	42.90	18.73	10	15–73
15 Weeks	65.80	20.64	10	15–88	58.20	22.21	10	36–90
26 Weeks	68.50	17.78	10	13–90	60.90	22.13	10	39–89
37 Weeks	71.60	17.63	10	20–91	63.60	20.46	10	40–39
48 Weeks	73.10	18.26	10	32–89	65.30	18.54	10	42–95
Syntactic Measures								
Clauses/T-Unit:								
Conversation								
4 Weeks	1.11	.45	10	0–1.89	1.20	.51	10	0–1.54
15 Weeks	1.27	.19	10	1.00–1.80	1.43	.27	10	1.00–1.59
26 Weeks	1.28	.26	10	0–1.61	1.15	.44	10	1.00–1.77
37 Weeks	1.27	.59	10	1.00–1.82	1.31	.26	10	0–2.29
48 Weeks	1.33	.32	10	1.12–1.76	1.38	.26	10	1.00–1.91
PICA Subtest I								
4 Weeks	1.04	.41	10	1.00–1.68	1.36	.25	10	0–1.64
15 Weeks	1.26	.34	10	1.00–2.04	1.30	.33	10	1.00–2.10
26 Weeks	1.22	.49	10	0–1.78	1.22	.49	10	0–1.90
37 Weeks	1.27	.30	10	0–2.10	1.20	.52	10	1.00–2.00
48 Weeks	1.36	.46	10	0–1.58	1.06	.42	10	1.00–2.50
Words/Clause:								
Conversation								
4 Weeks	3.91	1.68	10	0–7.48	4.99	2.05	10	0–6.21
15 Weeks	5.09	1.65	10	2.00–5.57	4.86	1.17	10	1.00–6.77
26 Weeks	5.02	1.52	10	0–6.38	5.15	1.89	10	1.00–6.53
37 Weeks	4.71	1.73	10	3.00–7.50	5.48	1.27	10	0–6.27
48 Weeks	4.86	1.52	10	2.33–6.44	5.11	1.27	10	1.00–6.39
PICA Subtest I								
4 Weeks	3.89	1.72	10	1.00–5.78	4.25	1.60	10	0–6.13
15 Weeks	4.11	1.40	10	2.69–5.18	4.50	.69	10	1.00–6.50
26 Weeks	4.62	2.18	10	0–5.53	3.80	1.62	10	0–8.50
37 Weeks	4.49	1.59	10	0–6.10	4.26	1.77	10	1.00–6.55
48 Weeks	4.73	1.75	10	0–6.36	4.57	1.90	10	1.80–7.82

Table 6, Continued. Means, standard deviations, and range for each measure over time for individual and group treatment groups.

Measure	Individual				Group			
	Mean	SD	n	Range	Mean	SD	n	Range
				Syntactic Measures, continued				
Words/T-Unit:								
Conversation								
4 Weeks	4.96	2.69	10	0-10.61	6.69	3.16	10	0- 9.54
15 Weeks	6.65	2.60	10	2.00- 9.90	7.12	2.42	10	1.00- 9.14
26 Weeks	6.60	2.59	10	0- 9.30	6.55	2.54	10	1.00- 9.59
37 Weeks	6.62	3.06	10	3.00-10.00	7.28	2.28	10	0-10.86
48 Weeks	6.63	2.66	10	2.33-11.25	7.19	2.40	10	1.00- 9.94
PICA Subtest I								
4 Weeks	4.54	2.22	10	1.33- 9.35	6.10	2.84	10	0- 7.67
15 Weeks	5.28	2.30	10	3.50-10.00	5.87	1.87	10	1.00- 9.40
26 Weeks	6.10	2.61	10	2.90- 7.37	5.10	2.20	10	0- 8.63
37 Weeks	5.81	2.46	10	0-10.91	5.63	2.70	10	1.00- 8.64
48 Weeks	6.36	2.67	10	0- 8.58	5.39	2.42	10	1.80-12.08
Syntactic Well-Formedness:								
Conversation								
4 Weeks	59.89	18.66	9	30- 83	69.55	14.13	8	56- 93
15 Weeks	62.47	15.27	9	35- 77	68.89	18.00	8	40-100
26 Weeks	68.40	12.52	9	42- 81	78.06	14.36	8	51-100
37 Weeks	63.74	20.18	9	14- 83	74.25	17.10	8	45- 96
48 Weeks	72.60	13.32	9	53-100	70.11	12.97	8	50- 83
PICA Subtest I								
4 Weeks	69.54	27.75	9	17-100	52.17	22.21	9	0-100
15 Weeks	67.32	17.93	9	41- 95	68.34	18.34	9	41- 95
26 Weeks	58.61	19.67	9	27- 80	77.38	13.67	9	27-100
37 Weeks	76.33	18.23	9	17-100	79.17	12.14	9	53-100
48 Weeks	69.21	18.69	9	43-100	77.27	13.34	9	43-100
				Semantic Measure				
Semantic Accuracy:								
Conversation								
4 Weeks	66.92	31.95	9	0-100	69.49	26.65	8	31-100
15 Weeks	73.16	23.43	9	24-100	79.61	15.89	8	51-100
26 Weeks	78.57	27.02	9	10-100	85.46	12.96	8	64-100
37 Weeks	82.60	27.73	9	14-100	81.73	12.17	8	31-100
48 Weeks	78.04	22.76	9	25-100	91.60	12.39	8	63-100

Table 6, Continued. Means, standard deviations, and range for each measure over time for individual and group treatment groups.

Measure	Individual				Group			
	Mean	SD	n	Range	Mean	SD	n	Range
				Semantic Measure, continued				
Semantic Accuracy:								
PICA Subtest I								
4 Weeks	59.73	30.17	9	0- 93	45.89	26.79	9	0- 90
15 Weeks	78.59	28.02	9	9-100	82.26	11.05	9	66- 93
26 Weeks	71.82	28.47	9	0- 91	82.36	10.61	9	67-100
37 Weeks	69.52	31.24	9	0-100	87.83	9.85	9	0- 90
48 Weeks	74.32	30.59	9	0-100	87.07	10.32	9	73-100
				Pragmatic Measure				
Pragmatic Appropriateness:								
Conversation								
4 Weeks	88.00	7.26	10	72- 97	86.90	4.58	10	79- 93
15 Weeks	90.10	7.50	10	76- 97	92.20	3.99	10	83- 97
26 Weeks	91.50	6.06	10	79- 97	91.20	4.42	10	83- 97
37 Weeks	92.80	6.88	10	79-100	91.70	4.42	10	83- 97
48 Weeks	92.20	6.14	10	83-100	93.60	5.21	10	83-100

Table 7. Summary Analysis of Variance Table for Differences Between PICA and Conversation Sample Sources on the Syntactic and Semantic Language Performance Measures.

Source	SS	DF	MS	F	P
Clauses per T-Unit					
Sample	.02	1,19	.02	.25	.62 ns
Sample Within Time	.44	5,95	.09	.99	.43 ns
Words per Clause					
Sample	9.59	1,19	9.59	4.61	.05 *
Sample Within Time	26.58	5,95	5.32	5.46	.00 *
Words per T-Unit					
Sample	16.05	1,19	16.05	5.43	.03 *
Sample Within Time	77.67	5,95	15.53	6.94	.00 *
Syntactic Well-Formedness					
Sample	1985.65	1,16	1985.65	7.26	.02 *
Sample Within Time	568.79	5,80	113.76	.48	.79 ns
Semantic Accuracy					
Sample	4067.01	1,16	4067.01	11.80	.00 *
Sample Within Time	5216.05	5,80	1043.21	7.45	.00 *

*: $p < .05$

($F(1,19) = 4.61$, $p = .05$), Words per T-Unit ($F(1,19) = 5.43$, $p = .03$), Syntactic Well-formedness ($F(1,16) = 7.26$, $p = .02$), and Semantic Accuracy ($F(1,16) = 11.80$, $p = .00$). Significant differences were also found for sample source within time for Words per Clause ($F(5,95) = 5.46$, $p = .00$), Words per T-Unit ($F(5,95) = 6.94$, $p = .00$), and Semantic Accuracy ($F(5,80) = 7.45$, $p = .00$). Due to these observed differences, subjects's language performance scores obtained from PICA Subtest I samples and from conversation samples were analyzed as separate variables.

Each conversation and PICA Subtest I sample was timed for length to determine average sample source length. The mean length of the 100 conversation samples was 158.10 seconds (2 minutes, 38 seconds) with a standard deviation of 62.24 and a range of 63 to 349 seconds. Mean length of the 100 PICA Subtest I samples was 145.69 seconds (2 minutes, 25 seconds) with a standard deviation of 132.25 and a range of 25 to 693 seconds.

Subjects' language performance scores were analyzed in a 4 (time) x 2 (aphasia group) x 2 (treatment group) repeated measures analysis of covariance (ANCOVA) with contrasts in order to control for initial language severity at 4 weeks postonset. These results are summarized in Table 8. Because performance at 4 weeks

Table 8. Repeated measures analysis of covariance with contrasts for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P	
PICA Overall Percentile Score:						
Aphasia Group	134.30	1,16	134.30	.24	.63	ns
Treatment Group	936.79	1,16	936.79	1.70	.21	ns
Time	608.55	3,51	202.85	10.69	.00	*
15 to 26 Weeks	72.90	1,17	72.90	3.47	.08	ns
26 to 37 Weeks	84.10	1,17	84.10	12.09	.003	*
37 to 48 Weeks	25.60	1,17	25.60	2.20	.16	ns
Aphasia Group x Time	293.56	3,51	978.56	5.16	.003	*
15 to 26 Weeks	80.48	1,17	80.48	3.83	.07	ns
26 to 37 Weeks	31.24	1,17	31.24	4.49	.05	*
37 to 48 Weeks	0.23	1,17	0.23	0.02	.89	ns
Treatment Group x Time	40.37	3,51	13.46	0.71	.55	ns
15 to 26 Weeks	12.88	1,17	12.88	0.16	.44	ns
26 to 37 Weeks	2.74	1,17	2.74	0.39	.54	ns
37 to 48 Weeks	0.23	1,17	0.23	0.02	.89	ns
Conversation Clauses per T-Unit:						
Aphasia Group	0.56	1,16	0.56	5.08	.04	*
Treatment Group	0.13	1,16	0.13	1.14	.30	ns
Time	0.26	3,51	0.09	1.35	.27	ns
15 to 26 Weeks	0.18	1,17	0.18	3.74	.07	ns
26 to 37 Weeks	0.05	1,17	0.05	0.57	.46	ns
37 to 48 Weeks	0.05	1,17	0.05	0.54	.47	ns
Aphasia Group x Time	0.10	3,51	0.03	0.50	.68	ns
15 to 26 Weeks	0.00	1,17	0.00	0.02	.90	ns
26 to 37 Weeks	0.04	1,17	0.04	0.42	.52	ns
37 to 48 Weeks	0.05	1,17	0.05	0.54	.47	ns
Treatment Group x Time	0.21	3,51	0.07	1.06	.37	ns
15 to 26 Weeks	0.19	1,17	0.19	3.92	.06	ns
26 to 37 Weeks	0.03	1,17	0.03	0.32	.58	ns
37 to 48 Weeks	0.02	1,17	0.02	0.19	.67	ns

Table 8, Continued. Repeated measures analysis of covariance with contrasts for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P	
PICA Subtest I Clauses per T-Unit:						
Aphasia Group	0.17	1,16	0.17	.84	.37	ns
Treatment Group	1.73	1,16	1.73	8.53	.01	*
Time	0.06	3,51	0.02	0.19	.90	ns
15 to 26 Weeks	0.04	1,17	0.04	0.42	.53	ns
26 to 37 Weeks	0.00	1,17	0.00	0.03	.86	ns
37 to 48 Weeks	0.00	1,17	0.00	0.04	.84	ns
Aphasia Group x Time	0.16	3,51	0.05	0.53	.67	ns
15 to 26 Weeks	0.00	1,17	0.00	0.05	.83	ns
26 to 37 Weeks	0.06	1,17	0.06	0.63	.44	ns
37 to 48 Weeks	0.00	1,17	0.00	0.00	.97	ns
Treatment Group x Time	0.46	3,51	0.15	1.52	.22	ns
15 to 26 Weeks	0.00	1,17	0.00	0.06	.81	ns
26 to 37 Weeks	0.04	1,17	0.04	0.48	.50	ns
37 to 48 Weeks	0.11	1,17	0.11	0.84	.37	ns
Conversation Words per Clause:						
Aphasia Group	1.14	1,16	1.14	0.19	.66	ns
Treatment Group	1.35	1,16	1.35	0.23	.64	ns
Time	0.24	3,51	0.08	0.15	.93	ns
15 to 26 Weeks	0.11	1,17	0.11	0.25	.62	ns
26 to 37 Weeks	0.00	1,17	0.00	0.00	.95	ns
37 to 48 Weeks	0.13	1,17	0.13	0.38	.54	ns
Aphasia Group x Time	2.43	3,51	0.08	1.48	.23	ns
15 to 26 Weeks	0.00	1,17	0.00	0.00	.94	ns
26 to 37 Weeks	1.49	1,17	1.49	2.13	.16	ns
37 to 48 Weeks	0.11	1,17	0.11	0.34	.57	ns
Treatment Group x Time	4.17	3,51	1.39	2.53	.07	ns
15 to 26 Weeks	0.30	1,17	0.30	0.67	.43	ns
26 to 37 Weeks	2.00	1,17	2.00	2.85	.11	ns
37 to 48 Weeks	0.80	1,17	0.80	2.40	.14	ns

Table 8, Continued. Repeated measures analysis of covariance with contrasts for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P	
PICA Subtest I Words per Clause:						
Aphasia Group	0.41	1,16	0.41	0.11	.74	ns
Treatment Group	4.42	1,16	4.42	1.22	.29	ns
Time	2.19	3,51	0.73	1.05	.38	ns
15 to 26 Weeks	0.09	1,17	0.09	0.22	.65	ns
26 to 37 Weeks	0.29	1,17	0.29	0.49	.50	ns
37 to 48 Weeks	0.75	1,17	0.75	1.29	.27	ns
Aphasia Group x Time	8.68	3,51	2.89	4.15	.01	*
15 to 26 Weeks	8.67	1,17	8.67	20.84	.00	*
26 to 37 Weeks	2.30	1,17	2.30	3.82	.07	ns
37 to 48 Weeks	0.00	1,17	0.00	0.01	.94	ns
Treatment Group x Time	8.57	3,51	2.86	4.10	.01	*
15 to 26 Weeks	8.56	1,17	8.56	20.57	.00	*
26 to 37 Weeks	2.14	1,17	2.14	3.55	.08	ns
37 to 48 Weeks	0.00	1,17	0.00	0.01	.94	ns
Conversation Words per T-Unit:						
Aphasia Group	2.78	1,16	2.78	0.26	.61	ns
Treatment Group	9.66	1,16	9.66	0.92	.35	ns
Time	1.76	3,51	0.59	0.39	.76	ns
15 to 26 Weeks	0.96	1,17	0.96	1.04	.32	ns
26 to 37 Weeks	1.39	1,17	1.39	0.71	.41	ns
37 to 48 Weeks	0.02	1,17	0.02	0.01	.93	ns
Aphasia Group x Time	2.66	3,51	0.89	0.59	.63	ns
15 to 26 Weeks	1.71	1,17	1.71	1.86	.19	ns
26 to 37 Weeks	0.13	1,17	0.13	0.07	.80	ns
37 to 48 Weeks	0.30	1,17	0.30	0.14	.72	ns
Treatment Group x Time	1.33	3,51	0.44	0.29	.83	ns
15 to 26 Weeks	0.06	1,17	0.06	0.06	.81	ns
26 to 37 Weeks	0.77	1,17	0.77	0.39	.54	ns
37 to 48 Weeks	0.00	1,17	0.00	0.00	.96	ns

Table 8, Continued. Repeated measures analysis of covariance with contrasts for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P	
PICA Subtest I Words per T-Unit:						
Aphasia Group	4.09	1,16	4.09	0.56	.47	ns
Treatment Group	39.41	1,16	39.41	5.36	.03	*
Time	1.15	3,51	0.38	0.20	.89	ns
15 to 26 Weeks	0.00	1,17	0.00	0.01	.94	ns
26 to 37 Weeks	0.15	1,17	0.15	0.10	.76	ns
37 to 48 Weeks	0.24	1,17	0.24	0.10	.76	ns
Aphasia Group x Time	6.27	3,51	2.09	1.12	.35	ns
15 to 26 Weeks	4.96	1,17	4.96	3.49	.08	ns
26 to 37 Weeks	0.10	1,17	0.10	0.07	.79	ns
37 to 48 Weeks	0.00	1,17	0.00	0.00	.98	ns
Treatment Group x Time	13.08	3,51	4.36	2.33	.09	ns
15 to 26 Weeks	11.02	1,17	11.02	7.21	.02	*
26 to 37 Weeks	1.73	1,17	1.73	1.19	.29	ns
37 to 48 Weeks	1.34	1,17	1.34	0.53	.48	ns
Conversation Syntactic Well-Formedness:						
Aphasia Group	3.11	1,16	3.11	0.01	.93	ns
Treatment Group	204.75	1,16	204.75	0.53	.48	ns
Time	574.66	3,51	191.55	0.88	.46	ns
15 to 26 Weeks	475.87	1,17	475.87	1.79	.20	ns
26 to 37 Weeks	186.19	1,17	186.19	0.78	.39	ns
37 to 48 Weeks	90.62	1,17	90.62	0.29	.60	ns
Aphasia Group x Time	140.25	3,51	46.75	0.22	.89	ns
15 to 26 Weeks	3.86	1,17	3.86	0.01	.91	ns
26 to 37 Weeks	47.01	1,17	47.01	0.20	.66	ns
37 to 48 Weeks	136.39	1,17	136.39	0.44	.52	ns
Treatment Group x Time	162.03	3,51	54.01	0.25	.86	ns
15 to 26 Weeks	25.37	1,17	25.37	0.10	.76	ns
26 to 37 Weeks	7.60	1,17	7.60	0.03	.86	ns
37 to 48 Weeks	88.05	1,17	88.05	0.28	.60	ns

Table 8, Continued. Repeated measures analysis of covariance with contrasts for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P	
PICA Subtest I Syntactic Well-Formedness:						
Aphasia Group	991.90	1,14	991.90	1.25	.28	ns
Treatment Group	43.53	1,14	43.53	0.05	.82	ns
Time	1106.56	3,45	368.85	3.04	.04	*
15 to 26 Weeks	0.04	1,15	0.04	0.00	.99	ns
26 to 37 Weeks	779.22	1,15	779.22	10.65	.00	*
37 to 48 Weeks	131.86	1,15	131.86	1.49	.24	ns
Aphasia Group x Time	306.93	3,45	102.31	0.84	.48	ns
15 to 26 Weeks	29.57	1,15	29.57	0.22	.64	ns
26 to 37 Weeks	82.43	1,15	82.43	1.13	.31	ns
37 to 48 Weeks	246.10	1,15	246.10	2.78	.12	ns
Treatment Group x Time	773.28	3,45	257.76	2.12	.11	ns
15 to 26 Weeks	456.89	1,15	456.89	3.44	.08	ns
26 to 37 Weeks	647.05	1,15	647.05	8.84	.00	*
37 to 48 Weeks	196.62	1,15	196.62	2.22	.16	ns
Conversation Semantic Accuracy:						
Aphasia Group	288.21	1,13	288.21	0.21	.66	ns
Treatment Group	128.23	1,13	128.23	0.09	.77	ns
Time	704.33	3,42	234.78	2.09	.12	ns
15 to 26 Weeks	231.06	1,14	231.06	2.22	.16	ns
26 to 37 Weeks	21.66	1,14	21.66	0.20	.66	ns
37 to 48 Weeks	28.33	1,14	28.33	0.30	.59	ns
Aphasia Group x Time	348.35	3,42	116.11	1.03	.39	ns
15 to 26 Weeks	7.85	1,14	7.85	0.08	.79	ns
26 to 37 Weeks	298.62	1,14	298.62	2.77	.12	ns
37 to 48 Weeks	79.21	1,14	79.21	0.84	.38	ns
Treatment Group x Time	230.15	3,42	76.72	0.68	.57	ns
15 to 26 Weeks	1.01	1,14	1.01	0.01	.92	ns
26 to 37 Weeks	0.00	1,14	0.00	0.00	1.00	ns
37 to 48 Weeks	160.22	1,14	160.22	1.69	.21	ns

Table 8, Continued. Repeated measures analysis of covariance with contrasts for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P	
PICA Subtest I Semantic Accuracy:						
Aphasia Group	206.63	1,14	206.63	0.16	.70	ns
Treatment Group	2875.17	1,14	2875.17	2.22	.16	ns
Time	146.48	3,45	48.23	0.73	.54	ns
15 to 26 Weeks	100.37	1,15	100.37	1.19	.29	ns
26 to 37 Weeks	7.24	1,15	7.24	0.09	.77	ns
37 to 48 Weeks	44.36	1,15	44.36	1.41	.25	ns
Aphasia Group x Time	426.94	3,45	142.31	2.13	.11	ns
15 to 26 Weeks	0.41	1,15	0.41	0.00	.95	ns
26 to 37 Weeks	270.47	1,15	270.47	3.24	.09	ns
37 to 48 Weeks	28.09	1,15	28.09	0.89	.36	ns
Treatment Group x Time	155.59	3,45	51.86	0.78	.51	ns
15 to 26 Weeks	79.70	1,15	79.70	0.94	.35	ns
26 to 37 Weeks	9.49	1,15	9.49	0.11	.74	ns
37 to 48 Weeks	25.99	1,15	25.99	0.82	.38	ns
Conversation Pragmatics:						
Aphasia Group	9.83	1,16	9.83	0.22	.65	ns
Treatment Group	12.10	1,16	12.10	0.27	.61	ns
Time	39.74	3,51	11.25	1.77	.17	ns
15 to 26 Weeks	0.40	1,17	0.40	0.06	.81	ns
26 to 37 Weeks	8.10	1,17	8.10	1.65	.22	ns
37 to 48 Weeks	4.23	1,17	4.23	0.52	.48	ns
Aphasia Group x Time	11.12	3,51	3.71	0.49	.69	ns
15 to 26 Weeks	0.00	1,17	0.00	0.00	.98	ns
26 to 37 Weeks	6.88	1,17	6.88	1.40	.25	ns
37 to 48 Weeks	14.67	1,17	14.67	1.80	.20	ns
Treatment Group x Time	34.72	3,51	11.57	1.54	.21	ns
15 to 26 Weeks	11.90	1,17	11.90	1.79	.20	ns
26 to 37 Weeks	4.88	1,17	4.88	0.99	.33	ns
37 to 48 Weeks	14.67	1,17	14.67	1.80	.20	ns

postonset was used as a covariant, the analysis of covariance did not permit a comparison of performance between 4 and 15 weeks postonset. Thus, subjects' language performance scores at 4 and 15 weeks postonset were analysed in a 2 (time) x 2 (aphasia group) x 2 (treatment group) analyses of variance (ANOVA). The results are summarized in Table 9.

Syntactic, Semantic, and Pragmatic Change Over Time

Syntactic Performance

Clauses per T-Unit. Group mean syntactic complexity increased between 4 and 15 weeks postonset. Results of the ANOVA for conversation revealed a significant difference on clauses per T-unit ($F(1,17) = 4.86$, $p = .04$) in time in the absence of a group x time interaction. Mean clause per T-unit performance for all subjects increased from 1.16 to 1.35 for an increase of .19.

Words per T-Unit. Group mean utterance length increased between 4 and 15 weeks postonset. Results of the ANOVA disclosed a significant increase ($F(1,17) = 8.50$, $p = .01$) in words per T-unit in conversation. Mean words per T-unit increased from 5.82 at 4 weeks postonset to 6.89 at 15 weeks.

Syntactic Well-Formedness. Group mean performance

Table 9. Repeated measures analysis of variance for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P
PICA Overall Percentile Score:					
Aphasia Group	7186.73	1,17	7186.73	19.29	.00 *
Treatment Group	2218.15	1,17	2218.15	5.95	.02 *
Time	3367.23	1,17	3367.23	57.21	.00 *
Aphasia Group x Time	41.63	1,17	41.63	0.71	.41 ns
Treatment Group x Time	130.43	1,17	130.43	2.22	.15 ns
Conversation Clauses per T-Unit:					
Aphasia Group	2.04	1,17	2.04	20.63	.00 *
Treatment Group	0.04	1,17	0.04	0.42	.53 ns
Time	0.37	1,17	0.37	4.86	.04 *
Aphasia Group x Time	0.13	1,17	0.13	1.66	.21 ns
Treatment Group x Time	0.06	1,17	0.06	0.73	.41 ns
PICA Subtest I Clauses per T-Unit:					
Aphasia Group	0.28	1,17	0.28	1.59	.22 ns
Treatment Group	0.10	1,17	0.10	0.55	.47 ns
Time	0.06	1,17	0.06	1.48	.24 ns
Aphasia Group x Time	0.02	1,17	0.02	0.38	.55 ns
Treatment Group x Time	0.13	1,17	0.13	3.05	.10 ns
Conversation Words per Clause:					
Aphasia Group	35.75	1,17	35.75	12.97	.00 *
Treatment Group	1.37	1,17	1.37	0.50	.49 ns
Time	2.76	1,17	2.76	3.00	.10 ns
Aphasia Group x Time	1.77	1,17	1.77	1.92	.18 ns
Treatment Group x Time	1.87	1,17	1.87	2.03	.17 ns
PICA Subtest I Words per Clause:					
Aphasia Group	18.65	1,17	18.65	8.66	.00 *
Treatment Group	0.42	1,17	0.42	0.20	.66 ns
Time	0.55	1,17	0.55	0.83	.37 ns
Aphasia Group x Time	5.29	1,17	5.29	8.07	.01 *
Treatment Group x Time	0.93	1,17	0.93	1.42	.25 ns

Table 9, Continued. Repeated measures analysis of variance for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P
Conversation Words per T-Unit:					
Aphasia Group	152.68	1,17	152.68	28.45	.00 *
Treatment Group	3.03	1,17	3.03	0.56	.46 ns
Time	11.26	1,17	11.26	8.50	.01 *
Aphasia Group x Time	2.01	1,17	2.01	1.52	.23 ns
Treatment Group x Time	1.61	1,17	1.61	1.21	.29 ns
PICA Subtest I Words per T-Unit:					
Aphasia Group	43.19	1,17	43.19	6.11	.02 *
Treatment Group	0.24	1,17	0.24	0.03	.85 ns
Time	0.67	1,17	0.67	0.44	.52 ns
Aphasia Group x Time	6.48	1,17	6.48	4.24	.06 ns
Treatment Group x Time	0.14	1,17	0.14	0.09	.76 ns
Conversation Syntactic Well-Formedness:					
Aphasia Group	308.88	1,15	308.88	0.67	.42 ns
Treatment Group	63.78	1,15	63.78	0.14	.71 ns
Time	285.67	1,15	285.67	0.79	.39 ns
Aphasia Group x Time	718.24	1,15	718.24	1.98	.18 ns
Treatment Group x Time	969.76	1,15	969.76	2.67	.12 ns
PICA Subtest I Syntactic Well-Formedness:					
Aphasia Group	1461.69	1,16	1461.69	3.53	.08 ns
Treatment Group	1629.96	1,16	1629.96	3.94	.06 ns
Time	1292.40	1,16	1292.40	2.39	.14 ns
Aphasia Group x Time	1984.13	1,16	1984.13	3.67	.07 ns
Treatment Group x Time	2989.79	1,16	2989.79	5.53	.03 *
Conversation Semantic Accuracy:					
Aphasia Group	1399.38	1,15	1399.38	1.47	.24 ns
Treatment Group	142.67	1,15	142.67	0.15	.70 ns
Time	4.73	1,15	4.73	0.01	.93 ns
Aphasia Group x Time	1020.27	1,15	1020.27	1.68	.21 ns
Treatment Group x Time	649.23	1,15	649.23	1.07	.32 ns

Table 9, Continued. Repeated measures analysis of variance for aphasia group, treatment group, and time.

Source	SS	DF	MS	F	P
PICA Semantic Accuracy:					
Aphasia Group	2701.02	1,16	2701.02	2.70	.12 ns
Treatment Group	2008.57	1,16	2008.57	2.01	.18 ns
Time	7696.98	1,16	7696.98	30.62	.00 *
Aphasia Group x Time	387.60	1,16	387.60	1.54	.23 ns
Treatment Group x Time	1172.57	1,16	1172.57	4.67	.05 *
Pragmatics:					
Aphasia Group	200.12	1,17	200.12	3.49	.08 ns
Treatment Group	17.72	1,17	17.72	0.31	.59 ns
Time	136.90	1,17	136.90	18.03	.00 *
Aphasia Group x Time	8.40	1,17	8.40	1.11	.31 ns
Treatment Group x Time	33.60	1,17	33.60	4.42	.05 *

in syntactic well-formedness increased between 15 and 48 weeks postonset. Results of the ANCOVA revealed a significant main effect for time ($F(3,45) = 3.04$, $p = .04$) on PICA subtest I with a significant contrast between 26 and 37 weeks postonset ($F(1,15) = 10.65$, $p = .00$). These results indicate that percentage of syntactically well-formed utterances generally increased over time, particularly between 26 and 37 weeks.

Semantic Performance

Group mean semantic accuracy increased between 4 and 15 weeks postonset. Results of the ANOVA revealed a significant difference in time in PICA Subtest I ($F(1.16) = 30.62$, $p = .00$) between 4 and 15 weeks. This change represents a dramatic increase in semantic accuracy from 52.81 at 4 weeks to 80.42 at 15 weeks.

Pragmatic Performance

Group mean appropriate pragmatic performance increased between 4 and 15 weeks postonset. A significant difference in time was obtained in the ANOVA ($F(1,17) = 18.03$, $p = .00$). Mean performance was 87.45 at 4 weeks postonset and 91.15 at 15 weeks for an overall increase of 3.70.

Amounts and Rate of Change

PICA Overall Percentile Performance

Group mean PICA performance improved over time. A significant difference for time was obtained in the ANOVA ($F(1,17) = 57.21$, $p = .00$) and the ANCOVA ($F(3,51) = 10.69$, $p = .00$). Results of the ANCOVA contrasts for time indicate that mean group performance significantly increased their PICA Overall Percentile scores between 26 and 37 weeks ($F(1.17) = 12.09$, $p = .00$). The 15 to 26 week time period approached significance ($F(1,17) = 3.47$, $p = .08$). These results indicate that subjects' mean performance on the PICA Overall score, a measure of overall communicative ability, became significantly higher between 4 and 15 and between 26 and 37 weeks postonset with a trend for improved performance between 4 and 37 weeks postonset. Mean performance for the subjects was 43.65 at 4 weeks, 62.0 at 15 weeks, 64.7 at 26 weeks, 67.6 at 37 weeks, and 69.2 at 48 weeks. About 72% of total PICA overall improvement occurred by 15 weeks postonset. Percent of total performance improvement was 10.5%, 11.5%, and 6.2% improvement at 26, 37, and 48 weeks, respectively.

Syntactic Performance

Clauses per T-Unit. For conversation, mean clauses per T-unit was 1.16 at 4 weeks, 1.35 at 15 weeks, 1.22 at 26 weeks, 1.29 at 37 weeks, and 1.36 at 48 weeks. About 95% of the total increase occurred by 15 weeks. Percent of total performance fluctuated after 15 weeks

with about a 2% decline at 26 weeks, about a 4% increase at 37 weeks, and about 3% increase at 48 weeks. Mean overall performance for all 20 subjects in PICA subtest 1 remained virtually unchanged over time. Mean clauses per T-unit was 1.20 at 4 weeks, 1.28 at 15 weeks, 1.22 at 26 weeks, 1.24 at 37 weeks, and 1.21 at 48 weeks. A small increase in performance was evident by 15 weeks, however, performance slightly declined after this initial gain.

Words per clause. Words per clause showed slight overall mean increases in both conversation and PICA subtest I. In conversation, mean performance for all subjects at 4 weeks was 4.45. Performance increased over time with a slight reduction at 48 weeks. About 98% of the total increase occurred by 15 weeks. Percent of total performance increased about 20% and 3% at 26 and 37 weeks. Performance declined about 21% by 48 weeks. In PICA subtest I a different pattern of improvement was observed. Percent of total performance increased 40% at 15 weeks, declined about 16% at 26 weeks, increased about 29% at 37 weeks, and increased about 47% at 48 weeks. Therefore, the greatest amount of total increase in PICA Subtest I for all patients occurred at the 48 week time period.

Words per T-Unit. Overall mean words per T-unit differed between conversation and PICA subtest I. In

conversation the greatest increase in length occurred by 15 weeks. However, performance fluctuated over time. Mean words per T-unit was 5.82 at 4 weeks, 6.89 at 15 weeks, 6.58 at 26 weeks, 6.95 at 37 weeks, and 6.92 at 48 weeks. This fluctuation in performance represented about 98% of total change by 15 weeks, a decline of about 28% at 26 weeks, an increase of 34% at 37 weeks and about a 4% decline at 48 weeks. In PICA subtest I, words per T-unit were slightly lower than conversation at all time periods. Mean words per T-unit were 5.32 at 4 weeks, 5.57 at 15 weeks, 5.60 at 26 weeks, 5.72 at 37 weeks, and 5.88 at 48 weeks. About 46% of the total increase occurred by 15 weeks. Percent of total performance increased about 5%, 21%, and 3% at 26, 37, and 48 weeks.

Syntactic Well-Formedness. Overall mean syntactic well-formedness performance fluctuated over time in both conversation and PICA subtest I. In conversation, the mean percent of syntactic well-formedness was 64.44 at 4 weeks, 65.49 at 15 weeks, 72.95 at 26 weeks, 67.69 at 37 weeks, and 71.43 at 48 weeks. Rate of improvement was highest at 26 weeks with about 106% total change in accuracy. Percent of total performance increased 15% and 39% at 15 and 48 weeks, but declined about 61% at 37 weeks. In PICA subtest I the highest rate of total increase, 79%, occurred at 37 weeks. Performance

increased about 56% and 1% at 15 and 26 weeks, but declined about 36% at 48 weeks.

Semantic Performance

In conversation, the mean percentage of semantic accuracy was 68.13 at 4 weeks, 76.19 at 15 weeks, 81.81 at 26 weeks, 82.19 at 37 weeks, and 84.42 at 48 weeks. The majority of total improvement, about 49%, occurred by 15 weeks. Performance continued to improve with 34%, 2%, and 14% at 26, 37, and 48 weeks. In PICA subtest I, semantic accuracy was 52.81 at 4 weeks, 80.42 at 15 weeks, 77.09 at 26 weeks, 78.68 at 37 weeks, and 80.69 at 48 weeks. About 99% of the improvement occurred by 15 weeks. Performance fluctuated with a decline of 12% at 26 weeks and improvements of 6% and 7% at 37 and 48 weeks.

Pragmatic Performance

Pragmatic performance improved over time. Mean performance was 87.45 at 4 weeks, 91.15 at 15 weeks, 91.35 at 26 weeks, 92.25 at 37 weeks, and 92.90 at 48 weeks. The majority of total improvement occurred by 15 weeks with about 68% improvement in pragmatic performance. Performance was about 4% better by 26 weeks, 16% by 37 weeks, and 12% by 48 weeks.

Table 10 shows the number of specific inappropriate ratings for all 20 subjects over time. Only verbal aspects of pragmatic performance improved between 4 and

Table 10. Total Number of Subjects Exhibiting Specific Inappropriate Verbal, Paralinguistic, and Nonverbal Pragmatic Changes Over Time.

	Weeks Postonset				
	4	15	26	37	48
VERBAL ASPECTS					
Speech act pair analysis					
Variety of speech acts	2				
Topic selection	1				1
Topic introduction	1				1
Topic maintenance	4			1	1
Topic change	1				1
Turntaking initiation	5	3	5	1	4
Turntaking response					
Turntaking repair/revision	1				1
Turntaking pause time	1	1			1
Turntaking interruption/overlap	3		1	1	1
Turntaking feedback to speaker					
Turntaking adjacency					
Turntaking contingency	6	5	7	6	4
Turntaking quantity/conciseness	5	2		3	
Specificity/accuracy	18	16	14	15	10
Cohesion	6	4	2	3	6
Subtotal	53	32	30	32	28
PARALINGUISTIC ASPECTS					
Intelligibility	9	9	8	4	6
Vocal intensity	1	1	2	1	1
Vocal quality					
Prosody	2	1	2	1	1
Fluency	6	7	6	6	4
Subtotal	18	18	18	12	12
NONVERBAL ASPECTS					
Physical proximity					
Physical contacts					
Body posture					
Foot/leg and hand/arm movement	1			1	1
Gestures	1	1	1		1
Facial expression					
Eye gaze	1		1		
Subtotal	2	2	2	2	2
TOTAL	73	52	50	46	42

15 weeks. Improvements were particularly noteworthy in topic and turntaking abilities. Verbal aspects remained stable during the 15, 26, and 37 weeks periods. However, improvements in verbal aspects occurred between 37 and 48 weeks. These improvements occurred in a variety of behaviors, particularly in turntaking contingency and specificity/accuracy. Although improvements occurred between 37 and 48 weeks, two behaviors became slightly worse--turntaking initiation and cohesion. Paralinguistic aspects of performance showed no improvement until 37 and 48 weeks. These improvements occurred in intelligibility, vocal intensity, prosody, and fluency. Nonverbal aspects of performance remained stable over time.

Rate of Improvement Comparisons

Comparisons in rate of total improvement are shown in Table 11. About 64% of the syntactic, semantic, and pragmatic performance measures showed the greatest rate of change by 15 weeks. This observation is consistent with PICA Overall performance. About 36% of the performance measures reflected a different pattern of change from PICA Overall performance. Of these measures, one showed no real change over time, one showed the most change at 48 weeks, one at 26 weeks, and the other one at 37 weeks.

PICA Overall performance continued to improve over

Table 11. Distribution of Percent of Total Improvement for Each Language Measure Over Time.

Source	Weeks 4-15	15-26	26-37	37-48
	STANDARDIZED MEASURE			
PICA Overall	71.8%*	10.5%	11.5%	6.2%
	SYNTACTIC MEASURES			
Clauses/T-Unit				
Conversation	95.5%*	-2.5%	3.6%	3.4%
PICA Subtest I#	790.0%	-630.0%	170.0%	-230.0%
Words/Clause				
Conversation	98.1%*	19.7%	2.9%	-20.7%
PICA Subtest I	40.0%	-16.2%	29.3%	46.8%*
Words/T-Unit				
Conversation	97.7%*	-28.4%	34.3%	-3.6%
PICA Subtest I	45.9%*	4.9%	21.5%	27.7%
Syntactic Accuracy				
Conversation	15.0%	106.7%*	-60.9%	39.1%
PICA Subtest I	56.3%	1.3%	78.7%*	-36.4%
	SEMANTIC MEASURE			
Semantic Accuracy				
Conversation	49.4%*	34.4%	2.3%	13.7%
PICA Subtest I	99.0%*	-11.9%	5.6%	7.2%
	PRAGMATIC MEASURE			
Pragmatics				
Conversation	67.8%*	3.6%	16.5%	11.9%

KEY: * denotes greatest percentage of change
fluctuating change represents no overall change

time but showed a smaller increment in improvement by 48 weeks. No syntactic, semantic, or pragmatic performance measure showed the same pattern. These supplemental measures generally fluctuated over time. For example, PICA clauses per T-unit, conversation words per clause, conversation words per T-unit, and conversation syntactic well-formedness all showed a decline in performance at 48 weeks. These differences in total percent of rate change and patterns of change over time among different measures indicate that the complexities of language are not accurately reflected in a standardized measure such as the PICA.

Individual Subject Performance

Individual subject data indicating performance increase, reduction, or no change between time periods for each measure are shown in Table 12. The data further indicate variability in performance among measures and across time for each subject. In general, most subjects did not show steady increases in language performance over time. Notably, only 25% of the subjects showed increases in PICA overall percentile performance across all time periods. Most of the subjects' PICA performance fluctuated over time. Performance in syntactic, semantic, and pragmatic skills generally fluctuated over time for most subjects.

Table 12. Individual subject data demonstrating performance increase (+), no change (o), or decline (-) in each language measure over time.

SS/TIME*	PICA	C/T*		W/T*		W/C*		SYN%*		SEM%*		PRA%*
		C	P	C	P	C	P	C	P	C	P	
102:												
4-15	+	+	-	+	+	+	+	+	+	+	+	o
15-26	+	-	+	+	+	+	+	-	-	+	+	+
26-37	+	-	-	+	-	+	-	+	+	+	-	+
37-48	-	+	+	+	+	+	+	-	-	-	+	-
105:												
4-15	+	+	-	+	-	+	-	-	+	+	+	+
15-26	-	-	+	-	+	+	+	+	-	-	-	o
26-37	+	-	-	-	-	-	-	-	+	-	+	o
37-48	-	+	-	+	+	+	+	+	+	+	+	o
106:												
4-15	+	-	-	-	+	+	+	+	-	+	+	-
15-26	+	+	o	-	+	-	+	+	+	+	+	+
26-37	+	-	+	+	-	+	-	+	+	-	-	-
37-48	+	-	-	-	-	+	-	-	-	+	-	+
201:												
4-15	+	+	+	+	+	+	+	+	+	+	+	+
15-26	+	+	+	+	+	+	+	+	+	+	-	o
26-37	+	+	+	+	+	+	+	-	+	+	-	o
37-48	+	-	-	-	-	-	-	+	-	+	+	+
202:												
4-15	o	o	o	-	+	-	-	-	-	-	-	+
15-26	-	-	-	-	-	-	-	x	x	x	x	o
26-37	+	+	o	+	o	+	o	+	x	+	x	o
37-48	+	o	o	-	o	-	o	-	x	-	x	o
203:												
4-15	+	+	+	+	+	+	+	-	-	-	+	-
15-26	+	-	+	-	-	+	-	+	+	-	-	+
26-37	+	o	-	+	-	+	+	-	+	+	o	+
37-48	+	o	+	o	-	o	-	+	-	+	o	o
206:												
4-15	+	-	+	+	-	+	-	+	-	+	+	-
15-26	-	+	-	-	+	-	+	+	-	+	-	+
26-37	+	+	+	+	-	-	-	-	+	+	+	+
37-48	+	-	-	-	+	-	+	+	-	o	-	o

Table 12, continued. Individual subject data demonstrating performance increase (+), no change (o), or decline (-) in each language measure over time.

SS/TIME*	PICA	C/T* C	C/T* P	W/T* C	W/T* P	W/C* C	W/C* P	SYN%* C	SYN%* P	SEM%* C	SEM%* P	PRA%*
208:												
4-15	+	+	-	+	-	-	-	-	-	-	+	+
15-26	+	-	-	-	-	+	-	+	+	+	+	-
26-37	-	+	+	+	+	+	+	-	o	-	-	+
37-48	-	-	-	-	-	+	+	+	-	+	+	o
209:												
4-15	+	+	+	+	+	+	+	-	+	-	+	+
15-26	o	-	+	-	+	+	+	-	-	+	-	o
26-37	o	-	-	-	-	-	+	+	+	+	+	+
37-48	+	+	+	+	+	+	-	-	-	-	o	-
215:												
4-15	+	-	-	-	-	+	-	+	+	+	+	+
15-26	+	+	+	+	+	+	+	+	+	+	+	o
26-37	+	+	-	+	-	-	-	-	-	-	+	+
37-48	o	-	-	-	+	-	+	-	+	+	-	o
218:												
4-15	+	-	+	-	-	-	-	+	-	+	+	+
15-26	+	-	-	+	-	+	+	+	+	-	-	-
26-37	+	+	-	-	+	-	+	+	+	+	-	+
37-48	+	+	+	+	+	+	-	-	-	-	+	o
219:												
4-15	+	+	+	+	-	+	-	+	-	+	+	+
15-26	-	+	+	-	+	-	+	+	-	-	-	-
26-37	+	+	-	+	-	-	+	+	+	-	-	o
37-48	-	+	+	+	+	+	-	-	-	+	+	+
301:												
4-15	+	+	+	+	+	-	+	+	+	+	+	o
15-26	-	+	-	-	+	-	+	-	-	-	-	o
26-37	+	-	+	-	+	+	-	+	+	-	+	-
37-48	+	+	-	+	-	-	+	+	-	+	+	o
401:												
4-15	+	+	+	+	+	-	-	-	-	-	+	+
15-26	+	-	-	+	-	+	-	+	+	+	-	-
26-37	+	-	-	-	+	-	+	+	+	-	+	+
37-48	-	+	-	+	-	+	-	-	+	+	+	+

Table 12, continued. Individual subject data demonstrating performance increase (+), no change (o), or decline (-) in each language measure over time.

SS/TIME*	PICA	C/T*		W/T*		W/C*		SYN%*		SEM%*		PRA%*
		C	P	C	P	C	P	C	P	C	P	
408:												
4-15	+	+	+	+	+	+	+	-	-	-	+	+
15-26	+	-	-	+	-	+	+	-	-	+	+	+
26-37	+	-	-	-	-	-	-	+	+	+	-	o
37-48	-	+	+	+	+	-	+	-	-	-	+	-
411:												
4-15	+	+	+	+	+	+	+	+	+	+	+	+
15-26	+	+	+	+	-	+	-	-	+	o	-	-
26-37	+	-	-	+	+	+	+	-	o	o	+	o
37-48	+	+	+	-	+	-	+	+	o	-	o	+
416:												
4-15	+	+	-	-	-	-	-	+	+	+	+	+
15-26	-	-	-	-	-	-	-	+	+	+	+	+
26-37	o	+	+	+	+	+	+	-	-	-	+	o
37-48	-	-	-	-	-	-	+	-	+	+	-	+
417:												
4-15	+	-	+	+	+	+	-	-	-	o	+	+
15-26	+	+	-	+	-	-	-	-	+	o	-	o
26-37	+	+	+	+	+	+	+	-	+	-	+	o
37-48	-	-	-	-	-	+	+	+	+	-	+	o
506:												
4-15	+	+	+	+	+	+	+	x	x	x	x	+
15-26	+	o	-	o	-	o	-	o	x	o	x	+
26-37	o	-	+	-	+	-	+	x	x	x	+	o
37-48	+	+	o	+	+	+	+	x	o	+	-	+
507:												
4-15	+	+	-	+	-	+	-	+	+	-	+	+
15-26	+	-	+	+	-	+	-	-	-	-	-	o
26-37	+	-	-	-	+	-	+	-	-	+	-	-
37-48	-	+	-	+	+	-	+	o	+	o	+	+

Key: TIME - 4, 15, 26, 37, 48 Weeks Postonset
PICA - PICA Overall Percentile Score
C/T - Ratio of clauses and T-units
W/T - Ratio of words and T-units

Table 12, continued. Individual subject data demonstrating performance increase (+), no change (o), or decline (-) in each language measure over time.

Key: Continued,

W/C - Ratio of words and clauses
SYN% - Percentage of syntactically well-formed utterances
SEM% - Percentage of semantically appropriate utterances
PRAG% - Percentage of pragmatically appropriate behaviors
C - Conversation
P - PICA Subtest I
\+ - Increase in performance
\- - Reduction in performance
o - No change in performance
x - No T-unit was produced

Aphasia Group Differences

PICA Overall Percentile Performance

The ANOVA, shown in Table 9, disclosed a significant difference ($F(1,17) = 19.29$, $p = .00$) for aphasia group in the absence of any group x time interaction. Inspection of the means indicates that performance for the fluent group was higher than the nonfluent group. Mean PICA performance for the fluent group was 54.7 at 4 weeks postonset and 73.7 at 15 weeks postonset. Nonfluent group performance was 32.6 at 4 weeks postonset and 50.3 at 15 weeks postonset. This represents a difference of 22.1 at 4 weeks and 23.4 at 15 weeks.

The ANCOVA, shown in Table 8, resulted in a significant aphasia group x time interaction ($F(3,51) = 5.16$, $p = .00$) with a significant contrast between 26 and 37 weeks ($F(1,17) = 4.49$, $p = .05$). Results of the 15 to 26 week contrast approached significance ($F(1,17) = 3.83$, $p = .07$). This interaction indicates that while both groups continued to increase their scores over time, the nonfluent group's rate of increase was higher than the fluent group between 26 and 37 weeks postonset. Mean PICA performance for the fluent group increased from 73.7 at 15 weeks to 76.5 at 48 weeks for an overall

change of 2.8. The nonfluent group increased from 50.3 at 15 weeks to 61.9 at 48 weeks for an overall change of 11.0.

Syntactic Performance

Clauses per T-Unit. Results indicate that the fluent group was superior to the nonfluent group in syntactic complexity throughout all time periods. The ANOVA ($F(1,17) = 20.63$, $p = .00$) and ANCOVA ($F(1,16) = 5.08$, $p = .04$) disclosed significant differences in aphasia group in conversation. Mean conversation performance for the fluent group was 1.43 at 4 weeks, 1.54 at 15 weeks, 1.35 at 26 weeks, 1.52 at 37 weeks, and 1.51 at 48 weeks. Nonfluent group performance was .88 at 4 weeks, 1.16 at 15 weeks, 1.08 at 26 weeks, 1.06 at 37 weeks, and 1.21 at 48 weeks.

In general, the fluent subjects used a wider range of coordinating and subordinating clauses throughout the study. In contrast, the nonfluent subjects mainly produced a large percentage of infinitive clauses initially and later progressed to coordination and other subordinate clauses.

In addition to differences in the range of embedding, differences existed in the percentage of multi-clausal utterances produced by both groups throughout the study. The nonfluent group produced 10% multi-clausal utterances at 4 weeks postonset, 14% at 15

weeks, 19% at 26 weeks, 12% at 37 weeks, and 16% at 48 weeks. In contrast, the fluent group produced 30%, 39%, 27%, 32% and 39%, respectively. These observations indicate differences among fluent and nonfluent subjects on dimensions of syntactic complexity, variety of clauses, and percentage of multi-clausal utterances produced.

Words per Clause. Clausal length differed significantly between the fluent and nonfluent groups. Results of the ANOVA indicated a significant aphasia group difference in PICA Subtest I ($F(1,17) = 9.66$, $p = .00$) in the presence of a significant aphasia group x time interaction ($F(1,17) = 8.07$, $p = .01$). These results indicate that while the fluent group produced more words per clause in PICA Subtest I than the nonfluent group, the fluent group declined in clausal length over time and the nonfluent group increased clausal length. Mean words per clause performance for the fluent group was 5.72 and 5.60 for 4 and 15 weeks, respectively, for PICA Subtest I. Mean performance for the nonfluent group was 3.17 and 4.35. This represents a difference of 2.55 at 4 weeks and 1.25 at 15 weeks between the two groups. Differences in amount of change was a decrease of .43 for the fluent group and an increase of .89 for the nonfluent group.

The decrease in words per clause for the fluent

group generally resulted from a reduction in empty lexicon such as filler phrases, and a reduction in self-corrections. For the nonfluent group, increases could generally be accounted for by increases in topicalization, expansions of noun and verb phrases, and increases in parenthetical phrases such as "you know."

Results of the ANOVA also disclosed a significant difference ($F(1,17) = 12.97$, $p = .00$) in aphasia group in conversation. This indicates that the fluent group produced more words per clause than the nonfluent group. Mean words per clause performance for the fluent group was 5.72 at 4 weeks and 5.60 at 15 weeks for a decline in performance of 0.12. Mean performance for the nonfluent group was 3.17 at 4 weeks and 4.35 at 15 weeks for an increase of 1.17. The differences between the two groups favored the fluent group by 2.55 at 4 weeks and 1.25 at 15 weeks.

Results of the ANCOVA revealed a significant aphasia group x time interaction ($F(3,51) = 4.15$, $p = .01$) with a significant contrast between 15 and 26 weeks ($F(1,17) = 20.84$, $p = .00$). Between 15 and 26 weeks, the fluent group increased the number of words per clause while there was a reduction in number of words in the nonfluent group. Performance for the fluent group was consistently higher than the nonfluent group. In general, the nonfluent subjects increased their number

of clauses per utterance and decreased their overall number of words per clause. The fluent subjects increased their ability to encode more words in a single clause. For example, at 15 weeks, a fluent subject might say "This is a pencil. I write with it." By 26 weeks, the same patient would say "and this pencil I write with it."

Words per T-Unit. The ANOVA disclosed a significant difference ($F(1,17) = 6.11$, $p = .02$) in aphasia group in PICA Subtest I. Results of the aphasia group x time interaction ($F(1,17) = 4.24$, $p = .06$) in PICA Subtest I performance approached significance. This indicates that the fluent group produced longer utterances than the nonfluent group, but the nonfluent group increased the length of their utterances over time and the fluent group slightly decreased the length of their utterances. Mean words per T-unit for the fluent group was 6.95 at 4 weeks and 6.28 at 15 weeks for a decline of .67. Mean words per T-unit for the nonfluent group was 3.68 at 4 weeks and 4.87 at 15 weeks for an increase of 1.19. Mean utterance length for the fluent group was 3.27 longer than the nonfluent group at 4 weeks and 1.41 at 15 weeks.

Results of the ANOVA in conversation disclosed a significant difference in both aphasia group ($F(1,17) = 28.45$, $p = 00$) and time ($F(1,17) = 8.50$, $p = .01$) in the

absence of a group x time interaction. This indicates that both groups increased utterance length at a similar rate, but utterance length in the fluent group was longer than in the nonfluent group. Mean words per T-unit for the fluent group was 8.17 at 4 weeks and 8.57 at 15 weeks. Performance for the nonfluent group was 3.48 at 4 weeks and 5.21 at 15 weeks. This represents an increase over time of .40 for the fluent group and 1.73 for the nonfluent group. The fluent group performance was 4.69 longer than the nonfluent group at 4 weeks and 3.36 longer at 15 weeks.

Syntactic Performance Comparison with Normative Data. In the absence of normative adult T-unit data, differences in fluent and nonfluent group performance for clauses per T-unit, words per clause, and words per T-unit were compared with school children performance in kindergarten, and grades one, two, three, five, and seven (Table 13). O'Donnell, Griffin, and Norris (1967, reported in Hunt, 1970) obtained spontaneous language samples from school children and studied syntactic development as measured by the T-Unit analysis. They found that clausal and utterance length increased at each grade level. Syntactic complexity, however, increased in a "zigzag" pattern. By the seventh grade, syntactic complexity was 1.26 words per T-unit, clausal length was 7.8 words, and utterance length was 9.8

Table 13. Comparison of Mean Kindergarten and Elementary Schoolchildren with Mean Fluent and Nonfluent Group Syntactic Performance on Clauses/T-Unit, Words/Clause, and Words/T-Unit Over Time.

	Kindergarten and Elementary Schoolchildren*					
	Grades					
	K	1	2	3	5	7
Clauses/T-Unit	1.16	1.19	1.18	1.21	1.19	1.26
Words/Clause	6.1	6.7	7.1	7.2	7.5	7.8
Words/T-Unit#	7.1	7.9	8.4	8.7	8.9	9.8

	Fluent Group				
	Time Periods				
	4	15	26	37	48
Clauses/T-Unit	1.43	1.54	1.35	1.52	1.51
Words/Clause	5.73	5.60	5.77	5.56	5.44
Words/T-Unit	8.17	8.57	7.77	8.39	8.17

	Nonfluent Group				
	Time Periods				
	4	15	26	37	48
Clauses/T-Unit	.88	1.16	1.08	1.06	1.21
Words/Clause	3.17	4.35	4.39	4.64	4.53
Words/T-Unit	3.48	5.21	5.38	5.51	5.65

* O'Donnell Data (Reported in Hunt, 1970)
\# Calculated from clauses/T-unit and words/clause

words.

In the fluent group, syntactic complexity generally increased over time. However, the ratio of clauses per T-unit was higher at all time periods when compared with seventh grade performance. Clauses per T-unit was 1.43, 1.54, 1.35, 1.52, and 1.51 at 4, 15, 26, 37, and 48 weeks, respectively, as compared to 1.26 for seventh grade performance. Ratio of words per clause, 5.73, 5.60, 5.77, 5.56, and 5.44, was lower at all time periods when compared to the seventh grade performance of 7.8. Utterance length in the fluent group was also lower than seventh grade performance. Utterance length fluctuated over time but was about 8 words per T-unit at all time periods. Seventh grade performance was about 9.8 words per T-unit.

In the nonfluent group, syntactic complexity by 48 weeks was comparable to seventh grade performance. Clauses per T-unit was .88, 1.16, 1.08, 1.06, and 1.21, at 4, 15, 26, 37, and 48 weeks, respectively. Seventh grade performance was 1.26. Both clausal and utterance lengths were lower at all time periods when comparing nonfluent and seventh grade performance. By 48 weeks, nonfluent clausal length was about 4.5 as compared to the seventh grade length of 7.8; nonfluent utterance length was about 5.6 as compared to 9.8.

Semantic Performance

There were no significant differences between groups in semantic performance.

Pragmatic Performance

There were no significant differences between groups in pragmatic performance.

Treatment Group Differences

PICA Overall Percentile Performance

Results of the ANOVA for treatment group revealed a significant difference ($F(1,17) = 5.95$, $p = .02$) among individually and group treated groups in the absence of a group x time interaction. Inspection of the means indicates that performance for the individually treated group was 44.4 at 4 weeks and 65.8 at 15 weeks compared to 42.9 and 58.2 for the group treated group. This represents a mean difference in favor of the individually treated group of 1.5 at 4 weeks and 7.6 at 15 weeks.

Syntactic Performance

Clauses per T-Unit. The ANCOVA disclosed a significant difference ($F(1,17) = 7.80$, $p = .01$) in treatment group in PICA Subtest I performance for this syntactic complexity measure of clauses per T-unit. This indicates that the patients who received individual treatment produced more clauses per T-unit than the

group who received group treatment. Inspection of the means indicates that between 15 and 48 weeks, the aphasic subjects who received individual treatment generally produced more clauses per T-unit. Mean syntactic complexity performance for the individual treatment group was 1.26 at 15 weeks, 1.22 at 26 weeks, 1.27 at 37 weeks and 1.36 at 48 weeks. Performance for the group treatment group was 1.30 at 15 weeks, 1.22 at 26 weeks, 1.20 at 37 weeks, and 1.06 at 48 weeks.

Words per Clause. The ANCOVA revealed a significant treatment group x time interaction ($F(3,51) = 4.10$, $p = .01$) with a significant contrast between 15 and 26 weeks ($F(1,17) = 20.57$, $p = 00$). Between the 15 to 26 time period, an increase in words per clause was observed in the group treatment group while the individual treatment group showed a reduction in performance.

Words per T-Unit. Results of the ANCOVA revealed a significant difference ($F(1,16) = 5.36$, $p = .03$) in treatment group in PICA Subtest I. This result indicates that the individually treated group produced longer utterances than the group treated group beginning at 26 weeks postonset and continuing until the end of treatment. Overall mean utterance length for the individual treatment group was 5.89. Mean utterance

length for the group treatment group was 5.50. This represents a mean difference of .39 in favor of individual treatment.

The overall treatment group x time interaction approached significance ($F(3,51) = 2.33$, $p = .09$), but only the 15 to 26 week contrast was significant ($F(1,17) = 7.21$, $p = .02$) for PICA Subtest I. Between 15 and 26 weeks, the aphasic subjects who were individually treated increased their number of words per T-unit while the subjects who were group treated decreased their number of words.

Syntactic Well-Formedness. A significant treatment group x time ($F(1,16) = 5.53$, $p = .03$) in PICA Subtest I was disclosed in the ANOVA. This result indicates that while the individually treated group performance was initially higher than the group treated group, the group who received group treatment increased their performance over time and the the individually treated group decreased performance. Performance for the individually treated group was 69.54 at 4 weeks and 67.32 at 15 weeks. Performance for the group treated group was 52.17 at 4 weeks and 68.34 at 15 weeks.

Although results of the ANCOVA for PICA Subtest I were not significant for a treatment group x time interaction, there was a significant treatment group x time contrast between 26 and 37 weeks ($F(1,15) = 8.84$, p

= .00). The contrast between 15 and 26 weeks approached significance ($F(1,15) = 3.44$, $p = .08$). Inspection of the means shows a steady increase in performance for the group treated group while the aphasic subjects who received individual treatment show a marked decrease in performance followed by a sharp increase.

Semantic Performance

Semantic abilities were measured by a plus/minus descriptive scale for accuracy in each T-unit. Results of the ANOVA revealed a significant treatment group x time interaction ($F(1,16) = 4.67$, $p = .05$) in conversation. This result indicates that the individually treated group performance was initially higher than the group treated group. However, the group treated group increased their rate of performance more than the individually treated group by 15 weeks postonset. The individually treated group performance was 59.73 at 4 weeks and 78.59 at 15 weeks for an increase of 18.86. The group treated group performance was 45.89 at 4 weeks and 82.26 at 15 weeks for an increase of 36.37.

Pragmatic Performance

Results of the ANOVA indicate a significant time effect ($F(1,17) = 18.03$, $p = .00$) in the presence of a significant treatment group x time interaction ($F(1,17) = 4.42$, $p = .05$). This indicates that while pragmatic

performance significantly improved between 4 and 15 weeks, the group who received group treatment increased performance more than the group who received individual treatment. Mean performance for the group treated group was 86.9 at 4 weeks and 92.2 at 15 weeks for an increase of 5.3. Mean performance for the individually treated group was 88.0 at 4 weeks and 90.1 at 15 weeks for an increase of 2.1.

CHAPTER 5

Discussion

Syntactic, Semantic, and Pragmatic Change Over Time

Results of this study showed that selected syntactic, semantic, and pragmatic aspects of language change over time in treated aphasic patients. Specifically, syntactic complexity, utterance length, clausal semantic accuracy, and pragmatic abilities improve over time. The results, along with those by others, demonstrate that the greatest language improvement in treated patients occurs within the first three months after a stroke (Ludlow, 1977; Wertz, et al., 1981; Wertz, et al., 1986).

The first three months postonset is also the period of spontaneous recovery (Culton, 1969; Sarno and Levita, 1971; Kertesz and McCabe, 1977; Shewan and Kertesz, 1984; Wertz, et al., 1986; Lendrem and Lincoln, 1985). Behavioral deficits measured during this spontaneous recovery period will reflect the confounding effects of both permanent and reversible processes (Braun, 1978). According to Kertesz and McCabe (1977), recovery after the first few weeks following a stroke is not well understood nor is much known about the interaction

between spontaneous recovery and treatment (LaPointe, 1985). However, reversible physiological processes probably account for much of behavioral recovery (Braun, 1978) and treatment may accelerate the course of these physiological processes during recovery (Basso, et al., 1979). Thus, the results obtained in the present study during the first three months postonset may represent treatment's enhancement of the course of spontaneous recovery.

Three syntactic measures showed significant changes. Mean conversation syntactic complexity and conversation utterance length both increased between 4 and 15 weeks. These results support previous research that has shown improvements in syntactic complexity during the first three months postonset (Ludlow, 1977). Increases in average utterance length support the contention that aphasic patients' language performance evolves over time toward the fluent-end of the fluent/nonfluent continuum (Kertesz and McCabe, 1977). Syntactic well-formedness in utterances did not improve significantly until 26 to 37 weeks postonset. This finding is consistent with the results of Dordain and Normand (1981). Their treated and untreated aphasic patients did not differ in grammatical abilities at one month postonset, but the treated patients were superior at six months postonset. Thus, syntactic

well-formedness may improve more in treated patients.

PICA Subtest I semantic accuracy in clausal utterances improved significantly between 4 and 15 weeks postonset. However, semantic accuracy in PICA Subtest I did not improve significantly after 15 weeks, and semantic accuracy did not improve significantly in conversation at any point in time. These results imply that a structured task such as describing the function of objects may be used in treatment to improve semantic accuracy during the early stages of recovery.

Significant pragmatic improvements occurred during the 4 to 15 weeks period. All of these improvements occurred in the verbal aspects of pragmatics. No changes occurred in the paralinguistic and nonverbal aspects of pragmatics during this same period. This result extends the improvement period beyond the first month postonset (Piehler and Holland, 1984) to the 3-4 month postonset period. While pragmatic skills at all time periods were relatively preserved (Prutting and Kirchner, 1987), this early period of reduced abilities has direct clinical implications. From an assessment viewpoint, these pragmatic behaviors that are disrupted during the early stages of recovery should be documented and discussed with the patient and his/her family. Current assessment procedures that rely on linguistic measures of language do not provide families with

sufficient information to understand how a language impairment affects an aphasic patient's communicative abilities in natural settings. A pragmatic focus can provide families and patients with an understanding of specific deficits such as a reduced ability to continue a conversational topic. Also, as the results of this study indicate, pragmatic performance improves over time. This improvement, if documented clinically, can provide a communicatively relevant sense of recovery for a patient and his/her family.

Amounts and Rate of Change

Comparisons of PICA overall performance with syntactic, semantic, and pragmatic performance, revealed similarities and differences in the patterns of changes for each measure. First, most language gains occurred during the first 15 weeks postonset. But, the patterns of recovery differed between the PICA and the other measures. Mean PICA overall performance continued to improve over time but gradually declined in the rate of improvement between 4 and 48 weeks postonset. The syntactic, semantic, and pragmatic aspects of language varied over time with improvements and declines scattered throughout the 4 to 48 weeks. This result supports previous claims that a criterial measure of

performance, such as a standardized test, does not provide complete information about language performance. A standardized test such as the PICA reports a composite score that represents many different aspects of language. According to Porch (1967) the PICA Overall score "is the best single index of the patient's general communicative ability" (p. 80). The key phrase regarding the purpose of the PICA is "general communicative ability." This assessment of general language ability has not been disproven. What the present study indicates is that an overall measure of performance, for example, the PICA overall percentile score, can confound interpretations of behavioral recovery by overestimating or by indicating that recovery has not occur. This can be avoided by employing specific syntactic, semantic, and pragmatic measures of performance that reflect the continuity of performance over time.

The inconsistency in recovery patterns for the syntactic, semantic, and pragmatic aspects of language may resemble Ochs's (1983) models of language acquisition. She described two models--a retention model and a replacement model. A replacement model for language represents a stairstep progression of language performance where a previously acquired behavior is replaced by a more complex behavior and continues to

approach the normal adult model of language. A retention model represents a dynamic progression where previously acquired behaviors continued to be used as new behaviors are acquired and used. For aphasic patients, a replacement model would indicate a steady improvement in performance. A retention model would predict more inconsistency in performance similar to that observed in the present study.

The results of this study support an asynchronous pattern of recovery in specific language behaviors that has been discussed in previous research (Kenin and Swisher, 1972; and Ludlow, 1977). A stroke seldom affects all aspects of language similarly. Thus, recovery of language following a stroke may not proceed similarly. Therefore, standardized test scores over time may misrepresent the complexities of language change and obscure subtle changes in language that may be amenable to treatment.

These two aspects of language recovery, inconsistency and asynchrony, may provide an indirect indication of brain-language recovery following a stroke. Intrinsic and extrinsic factors may combine and interact to produce a nonlinear recovery process. Goldberg (1986) describes recovery as an adaptive interaction and dynamic relationship between the environment and its brain representation. Treatment is

an active process whereby the interaction between the physiologic changes and reorganization of brain systems following a stroke are influenced by specific training and/or environmental manipulation (Goldberg, 1986). However, many aspects of aphasia treatment have not been rigorously tested (Rosenbek, 1979), and the processes of language evolution and brain recovery are poorly understood.

Given our current lack of understanding regarding language recovery, brain recovery, and treatment, it is important to document all aspects of language changes carefully over time to determine what changes when. From a clinical perspective, inconsistency in language performance may require modifications in the clinical management of aphasic patients. It may no longer be appropriate to discharge a patient from treatment if there is a decline in performance based upon the results of one language measure taken at one point in time. Periodic declines and improvements in performance during the first year following a stroke may reflect a natural course in language recovery that will ultimately result in an overall improvement in performance. Additionally, results obtained from one language measure may fail to document improvements in other aspects of language. Therefore, supplemental measures, such as the ones used in the present study, can assist in the documentation of

language performance not readily assessed in standardized measures.

Aphasia Group Differences

Performance differed on the language measures depending on the type, fluent or nonfluent, of aphasia. The fluent subjects used more complex syntax and longer utterances than the nonfluent subjects throughout the first year postonset. These results are consistent with those of Bates and her colleagues (1985) who studied syntactic complexity cross-culturally. They found that syntactic complexity was reduced in both fluent and nonfluent patients as compared to normals and that nonfluent patients used less complex syntax than fluent patients. Their results along with the longitudinal data from this study indicate that syntax is relatively preserved in aphasia. While there is a reduction in the use of complex syntax, the ability to produce it is not lost for all patients. According to Bates, et al., there is an increased use of complex syntax when it is contextually necessary. This implies that treatment for syntactic complexity should focus on facilitating the pragmatic necessity of complex syntactic usage.

The subjects in the present study were classified as fluent or nonfluent at 4 weeks postonset and their

language changes were documented over time. Because it is generally accepted that nonfluent patients who improve evolve toward the fluent end of the continuum (Kertesz and McCabe, 1977), it was expected that their utterances would become longer and their syntax would become more complex over time. The nonfluent group did improve in both syntactic complexity and utterance length. However, the nonfluent group consistently lagged behind the fluent group during the first year postonset. Interestingly, during the 4 to 15 week period, the fluent subjects reduced both syntactic complexity and length while the nonfluent subjects increased syntactic complexity and length. While the trend for increased syntactic complexity and utterance length is predictable for nonfluent patients, the reduction in complexity and length for fluent patients during the first three months postonset has not been previously reported. These reductions in fluent subjects appear to reflect a general pattern of improved syntactic and lexical control through a reduction in empty lexicon and an improved ability to use fewer words to communicate within the confines of a single utterance.

In addition to differences in overall utterance length, differences were observed in clausal length. Through the 48 week period, the fluent group produced

longer clauses than the nonfluent group. Consistent with the utterance length changes observed between 4 and 15 weeks, the fluent group decreased clausal length while the nonfluent group increased clausal length in PICA Subtest I. However, this pattern in clausal length was reversed during the 15 to 26 week period. During this time, the fluent group increased clausal length while the nonfluent group decreased clausal length. These clausal length changes may be reflecting the nature of the fluent/nonfluent dichotomy. During the early stages of recovery, the fluent patients may decrease clausal length by reducing the number of empty lexical items. At the same time, the nonfluent patients increase clausal length as they gain access to more lexical items. The reversal of this pattern is evidence for the variation in performance over and may reflect the retention model of language in that earlier used patterns of language, clausal length, continued to be used as new patterns were acquired.

Comparisons of fluent and nonfluent syntactic performance with school children provide an estimate of appropriate syntactic skills. Results obtained from this study indicate that the fluent group produced too many clauses per T-unit while clausal and utterance lengths were too short. In the nonfluent group, clausal and utterance lengths were also shorter than those of

seventh grade school children, however, by 48 weeks postonset, the nonfluent group's syntactic complexity was comparable with the language of seventh graders. These results indicate that three aspects of syntactic ability--complexity, clausal length, and utterance length-- may need to be targeted for treatment in fluent patients. In nonfluent patients, syntactic complexity generally increased over time to an appropriate level by 48 weeks. Clausal and utterance lengths, however, appear to require therapeutic intervention.

Treatment Group Differences

Results of comparisons between individually and group treated patients indicate significant differences between groups for syntactic and semantic skills in PICA Subtest I performance and for pragmatic skills in conversation performance. Individually treated patients used more complex syntax than group treated patients after the 15 week period. Utterance length during the 15 to 26 week period was also longer for the individual treatment group. The didactic nature of individual treatment may provide increased opportunities to improve selected syntactic skills.

The remaining significant differences favored the group treatment group. In general, the rate of

improvement for clausal length, syntactic well-formedness, semantic accuracy, and pragmatic performance was higher for the group treatment group. This overall higher rate of improvement for syntactic well-formedness, semantic accuracy, and pragmatics occurred during the first 15 weeks postonset. Syntactic well-formedness continued to improve during the 26 to 37 week period. Clausal length increased during the 15 to 26 week period.

These results indicate how the type of treatment may influence oral-expressive skills. A social, group environment would appear to be more conducive to enhancing the use of syntactically, semantically, and pragmatically appropriate expressions during the first three to nine months postonset. From a language standpoint, group therapy potentially provides opportunities for peer interaction (Sheehan, 1946; Backus, 1952), to increase the amount of generalization of language recovery to natural communication (Corbin, 1951), to recreate a social environment with appropriate communication needs (Sheehan, 1946; Bloom, 1962), to rehabilitate the "whole person" (Sheehan, 1946), and to stress sentence production (Sheehan, 1946). Treatment is concerned with both the mechanics of speech production and the use of speech in interpersonal relationships (Backus, 1952) and to assist a patient to

communicate at a functional level in the real world (LaPointe, 1985). The advocation of a social, group treatment is similar to Wepman's Thought-Centered Treatment for aphasia (1972, 1976). According to Wepman, the focus of treatment should be shifted away from linguistic demands to a more cognitive-social treatment.

The significant benefits of group treatment appears throughout the first nine months postonset. However, significant improvements in the appropriate use of language--pragmatics, semantic accuracy, and syntactic well-formedness appear confined to the first three months postonset. It may be that a significant level of syntactic, semantic, and pragmatic abilities is achieved early on due to a person's need to adapt and function in a social world. Once this adaptation is achieved, a shift in focus to other linguistic deficits, such as syntactic complexity, may be more efficiently approached. The results of Wertz et al. (1986) indicate that outcome of individual treatment is not hampered by delaying treatment for three months during the first six months postonset. Speculatively, the results from this study may indicate that direct didactic treatment may be more cost- and time-effective if implemented after an early social, adaptation period. For instance, group treatment during the first three months postonset could

be utilized to assist in general language recovery while keeping treatment costs at a minimum. After the first three months, direct, individual therapy could be implemented.

Methodological Considerations

The absence of a group x treatment x time interaction does not permit determining the combined effects of type of aphasia and treatment. Therefore, the results obtained for both must be considered tentative. It may be that the improvements in syntactic complexity observed in the individual treatment group result from a larger percentage of nonfluent subjects in that group. Because treatment differences were found, however, the effects of different treatments deserve a closer look in future research.

The data for the study were drawn from conversations and PICA Subtest I. The conversation and PICA data bases averaged 2-3 minutes each. The results suggest there were sufficient data to detect significant differences over time and among groups. Presently, no standards exist for the length of representative samples of language for different measures. Results from this study indicate that language samples of 2-3 minutes in duration permit determining length and complexity of

syntax, well-formedness and semantic accuracy of utterances, and screening of pragmatic abilities. Whether different results would be obtained with longer samples is unknown and could be targeted for future research.

There is also a paucity of information on comparison of language samples collected in different contexts. The few studies that have compared various contexts suggest that differences exist. For example, language gathered in a spontaneous, conversational context is usually more varied and complex than language gathered in an elicited task. Results from the present study indicate that differences exist between conversation and PICA Subtest I. This may represent the differences between spontaneous and elicited samples as well as dynamic and static sampling techniques. According to Clark (1973), language is misrepresented if all samples are assumed to be equivalent. It is a fallacy to assume that language collected in one context, such as an elicited test item, would represent language in another context, such as conversation. Language collected during a standardized test may be collected efficiently, but may not be generalizable to any other language context.

The artificial nature of subdividing language into components of syntax, semantics, and pragmatics is

problematic. However, the precedent for these subdivisions is well established in most standardized tests and descriptions of language in the literature (Saffran, Schwartz, and Marin, 1980; Nespoulous and Lecours, 1984). The results of this study indicate performance in these these subdivisions of language can be measured accurately over time. All aspects of language do not suffer equally in aphasia, and all do not recover similarly. Some improve, others remain stable, and some decline. Without subdivision, specific changes may go unnoticed.

The syntactic, semantic, and pragmatic measures used in this study appear to be sensitive to both aphasic language deficits and to subtle changes in these deficits that occur over time. Significant differences were detected among fluent and nonfluent groups as well as among treatment groups. Additionally, subtle changes that occurred over time were documented reliably. These syntactic, semantic, and pragmatic changes have received little attention in the treatment of aphasia. Since significant changes occur in these selected aspects of language, one can speculate how these changes could be manipulated by treatment. For example, syntactic complexity increased during the first three months postonset, and it differed between fluent and nonfluent patients. If the patterns of syntactic complexity

observed in this study were manipulated by treatment in a nonfluent patient, would the change observed early postonset continue? Beyn and Shokar-Trotskaya (1966) proposed a preventive treatment for nonfluent aphasic patients. Their original concept could be expanded to include syntactic complexity--especially the variety and amount of subordination observed in fluent patients--to "prevent" a low percentage of multi-clausal productions from emerging.

The measures used in this study have specific limitations. First, the T-unit was developed to document written and verbal changes in the syntax of school children. Therefore, there is very little to no information on "normative" adult skills. The normative data on the oral-expressive language of school children are limited, but some are available. There are problems, however, in applying developmental data to adult populations, normal or aphasic. While some parallels may exist between acquisition and re-acquisition of syntactic complexity, the cognitive and social bases for this ability differ vastly between children and adults. Because comparisons between children and adults may be invalid and because no adult normative data exist, the conclusions drawn from the T-unit data are limited. Differences existed between groups and changes occurred over time. How these

differences or re-acquired competencies compare to normal adults awaits further research.

A second limitation of the measures used in this study is a lack of demonstrated test-retest reliability. A criteria of any change measure is that on repeated administrations of the measure, similar results will be obtained. Currently, there is no test-retest reliability data on the T-unit analysis, the semantic judgment measure, or the pragmatic analysis.

The accuracy judgments for both grammatical well-formedness and semantic accuracy are limited measures. The measures were used to provide a gross estimate of these changes at the clausal level of analysis. These measures provided a valuable extension of the traditional T-unit analysis by charting whether syntactic well-formedness or semantic content changed over time. The intent of both measures was to preserve natural syntactic styles by not penalizing a subject for stylistic or dialectic variations. In addition, each T-unit received only one rating regardless of the number of violations. Therefore, these judgments represent an overall rating and do not provide a "density" measure of severity. These limitations might be overcome by tallying the number and type of syntactic and semantic violations as well as documenting the number and type of preserved skills. This type of specific information

would provide a better basis for treatment than global measures of well-formedness or content accuracy. For example, Kempler, Curtiss, and Jackson (in press) devised indepth analyses of semantic and syntactic skills to describe the spontaneous speech of patients with probable Alzheimer's Disease. The syntactic-semantic analysis included tallies of errors in morpho-syntax, in nonlexical grammatical markers, constituent movement, and errors in lexical use. Syntactic complexity was examined for range and frequency of syntactic constructions used. These included simple sentences, conjoined sentences and seven complex structures.

The Pragmatic Protocol provided a reliable measure of pragmatic skill that was sensitive to changes over time. The Protocol is designed to provide information about verbal, paralinguistic, and nonverbal aspects of a patient's communicative abilities. Since the Protocol is a screening tool, it does not provide indepth information on a particular aspect of pragmatics. Various studies have used the Pragmatic Protocol. The results of these and those from the present study indicate specific behaviors are disrupted in aphasia. These include specificity/accuracy, fluency, intelligibility, cohesion, and turntaking contingency.

Three criticisms can be made on the

generalization of the results of this study to the aphasic population. First, the subjects in this study were all male veterans. Whether the results would be similar for female aphasic patients requires investigation. Second, the subjects were highly motivated and treated intensely. Each received eight hours of treatment each week for 44 weeks. Additional research with patients who receive less or more treatment is necessary. Third, the patients were grouped according to a fluent/nonfluent dichotomy. Therefore, the fluent group was composed of patients exhibiting Wernicke's, conduction, anomic, or transcortical sensory aphasia types, and the nonfluent group was composed of patients exhibiting Broca's, transcortical motor, and global aphasia types. The results apply to this general, fluent/nonfluent dichotomy and cannot be generalized to a specific aphasic subtype, for example Broca's, Wernicke's, etc.

The study of language recovery in treated aphasic patients is naturally limited by methodological shortcomings of any study. However, in order to compile useful and meaningful results across a variety of treated language recovery studies, several important methodological issues must be addressed. First, the etiology of aphasia must be stated and similar for all subjects in the study. Second, the amount and type of

treatment must be the same for all subjects in a group. And, third, reliable measures of language should be used.

The results of this study add to the results of other treated aphasic language recovery studies. As previously stated, the subjects in this study were well defined aphasic patients. All subjects received the same amount of treatment between 4 and 48 weeks postonset and subjects were grouped according to the type of treatment received, individual or group.

According to Holland, Miller, Reinmuth, Bartlett, Fromm, Pashek, Stein, and Swindell (1985), any valid language analysis must account for a variety of language abilities simultaneously. The measures used in this study--standardized test, syntactic, semantic, and pragmatic performance--represent an indepth language analysis of longitudinal abilities and provides information about potentially important treated language recovery skills.

The choice of behavioral measures used to assess the recovery of language in aphasic patients affects clinical judgments as to when, whether, or how recovery has occurred. Initial deficits represent a baseline from which language recovery is measured and the specification of this recovery depends on the adequacy, comprehensiveness, and sensitivity of the behavioral

measures used (Braun, 1978). The results of this study suggest that the influence of brain damage on communication is best characterized by a battery of relevant language measures than any single measure.

CHAPTER 6

Summary and Conclusions

The majority of aphasia treatment studies have used standardized tests to measure overall language change. However, standardized tests are limited in several ways. First, discrepancies exist between standardized tests and observations of aphasic patients' conversational skill. Second, standardized tests emphasize general linguistic aspects of language and omit a broader pragmatic perspective. Third, standardized tests may over- or under-estimate a patient's language abilities and do not provide indepth testing of specific language skills. Therefore, the purposes of this study were to determine whether syntactic, semantic, and pragmatic aspects of language change over time and at different rates or amounts when compared to a standardized test, and to determine whether treatment or type of aphasia influences the amount of change in the various aspects of language.

Twenty aphasic patients, 10 fluent and 10 nonfluent, participated in the study. Each patient suffered a single, left hemisphere thromboembolic infarct. Treatment was administered eight hours each week for 44 weeks between one and 12 months postonset.

Ten patients received individual treatment and 10 received group treatment. The data came from videotaped language samples, conversation and PICA Subtest I, at 4, 15, 26, 37, and 48 weeks postonset. The conversation and PICA Subtest I samples were analyzed by a syntactic and semantic analyses and the conversation was further analyzed by a pragmatic analysis.

The data were analyzed by a repeated measures 2 x 2 x 2 analyses of variance and a 4 x 2 x 2 analyses of covariance with contrasts. Language scores at 4 weeks postonset served as the covariant.

Question 1

Do syntactic, semantic, and pragmatic aspects of language change over time in treated aphasic patients?

Syntactic complexity, utterance length, semantic accuracy, and pragmatic appropriateness improved between 4 and 15 weeks postonset. The amount of syntactically well-formed utterances improved between 26 and 37 weeks postonset. These results indicate that the majority of language improvements occur during the first three months following a stroke, but with continued treatment, additional improvement can be made.

Question 2

What are the amounts and rate of change in syntactic,

semantic, and pragmatic aspects of language as compared to the PICA overall percentile score?

A standardized test, such as the PICA, does not provide complete information about language performance over time. The majority of language improvement in the syntactic, semantic, and pragmatic aspects of language as well as the PICA occurred during the first 15 week period. However, patterns of recovery differed between the PICA and the other measures. Whereas, the PICA scores continued to improve over time but gradually declined in the rate of improvement between 4 and 48 weeks postonset, the syntactic, semantic, and pragmatic aspects of language performance varied over time with increases and decreases in scores scattered throughout the same time period.

Question 3

Is change in syntactic, semantic, and pragmatic aspects of language influenced by the type of aphasia, fluent or nonfluent or the type of treatment, individual or group?

Performance differed on the language measures depending on type of aphasia, fluent or nonfluent. The fluent group produced more complex syntax and longer utterances throughout the 4 to 48 week period. The nonfluent group improved in the use of complex syntax and longer utterances particularly between 4 and 15

weeks. During this same time, the fluent group showed a decline in syntactic complexity and utterance length.

Differences also occurred between treatment groups, individual or group. The individually treated patients used more complex syntax between 15 and 48 weeks postonset. Utterance length was also higher for this group between the 15 and 26 weeks period. However, rate of improvement favored the group who received group treatment. A higher rate of improvement in syntactic well-formedness, semantic accuracy, and pragmatics occurred during the first 15 weeks postonset. Syntactic well-formedness continued to improve during the 26 to 37 week period and clausal length increased during the 15 to 26 week period.

Conclusions

The purposes of testing for the assessment and treatment of aphasia are to detect the presence of aphasia, provide an accurate description of a patient's language skills, provide a focus for treatment, and provide a measure of language change over time. The results of this study show that no single measure meets the purposes of testing and the need for a battery of measures is recommended.

Long-term studies provide an opportunity to

characterize language recovery over time and contributes to the basis of physiologic-behavioral comparisons of aphasia types, fluent and nonfluent, and facilitates assessments of the specific treatments. The results of this study suggest that differences observed in fluent and nonfluent patients may provide evidence for the recovery of selected syntactic, semantic, and pragmatic skills following aphasia and the patterns of recovery may provide a basis for specific treatments.

REFERENCES

Aten, J. L., Caligiuri, M. P., and Holland, A. L. The efficacy of functional communication therapy for chronic aphasic patients. Journal of Speech and Hearing Disorders, 47, 93-96, 1982.

Backus, O. The use of a group structure in speech therapy. Journal of Speech and Hearing Disorders, 17, 116-122, 1952.

Basso, A., Capitani, E., and Vignolo, L. A. Influence of rehabilitation on language skills in aphasic patients. Archives of Neurology, 36, 190-196, 1979.

Bates, E., MacWhinney, B., Miceli, G., Smith, S., Zurif, E., Wulfeck, B., Friederici, A., Osman-Szagy, J., and Juarez, L. Cross-linguistic studies of language processing in aphasia. USPHS NS 19639-02, Annual Report, 1984-1985.

Bates, E. Language in Context. New York: Academic Press, 1976.

Bates, E., Hamby, S., and Zurif, E. The effects of focal brain damage on pragmatic expression. Canadian Journal of Psychology, 37, 59-84, 1983.

Beele, K. A., Davies, E., and Muller, D. J. Therapists' views on the clinical usefulness of four aphasia tests. British Journal of Disorders of Communication, 19, 169-178, 1984.

Benton, A. L. Problems of test construction in the field of aphasia. Cortex, 3, 32-53, 1967.

Beyn, E. and Shokar-Trotskaya, M. K. The preventive method of speech rehabilitation in aphasia. Cortex, 2, 96-108, 1966.

Binder, G. M. Aphasia: A societal and clinical appraisal of pragmatic and linguistic behaviors. University of California, Santa Barbara: Master's Thesis, 1984.

Bloom, L. and Lahey, M. Language Development and Language Disorders. New York: Wiley and Sons, 1978.

Bloom, L., Lahey, M., Hood, L., Lifter, K., and Fiess, K. Complex sentences: Acquisition of syntactic connectives and the semantic relations they encode. Journal of Child Language, 7, 235-261, 1980.

Bloom, L. M. A rationale for group treatment of aphasic patients. Journal of Speech and Hearing Disorders, 27, 11-16, 1962.

Bond, S. L., Ulatowska, H. K., Macaluso-Haynes, S., and May, E. B. Discourse production in aphasia: Relationship to severity of impairment. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1983.

Braun, J. J. Time and recovery from brain damage. In S. Finger (Ed.) Recovery from Brain Damage: Research and Theory. New York: Plenum, 1978.

Brookshire, R. H. An Introduction to Aphasia. Minneapolis: BRK Publishers, 1973.

Brown, P. and Fraser, C. Speech as a marker of situation. In K. R. Scherer and H. Giles (Eds.) Social Markers in Speech. Cambridge: Cambridge University Press, 1979.

Busch, C. R. and Brookshire, R. H. Referential communication abilities of aphasic speakers. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1985.

Chapey, R. The assessment of language disorders in adults. In R. Chapey (Ed.) Language Intervention Strategies in Adult Aphasia. Baltimore: Williams and Wilkins, 1981.

Clark, H. H. The language-as-fixed-effect fallacy: A critique of language statistics in psychological research. Journal of Verbal Learning and Verbal Behavior, 12, 335-359, 1973.

Clark, H. H. and Clark, E. V. Psychology and Language. New York: Harcourt Brace Jovanovich, Inc., 1977.

Corbin, M. L. Group speech therapy for motor aphasia and dysarthria. Journal of Speech and Hearing Disorders, 16, 21-34, 1951.

Crystal, D. Clinical Linguistics. New York: Springer-Verlag, 1981.

Crystal, D. Profiling Linguistic Disability. London: Edward Arnold, 1982.

Culton, G. L. Spontaneous recovery from aphasia. Journal of Speech and Hearing Research, 12, 825-832, 1969.

Darley, F. L. Evaluation of Appraisal Techniques in Speech and Language Pathology. Reading, Mass.: Addison-Wesley Publishing Co., 1979.

David, R., Enderby, P., and Bainton, D. Treatment of acquired aphasia: Speech therapists and volunteers compared. Journal of Neurology, Neurosurgery, and Psychiatry, 45, 957-961, 1982.

Dordain, M. and Normand, B. Comparative study of the oral language of aphasics with and without treatment. Folia Phoniat., 33, 369-379, 1981.

Drake, K. L. The assessment of pragmatics in aphasia. University of California, Santa Barbara: Master's Thesis, 1986.

Dromi, E. and Berman, R. A. Language-specific and language-general in developing syntax. Journal of Child Language, 13, 371-387, 1986.

Early, E. A. and VanDemark, A. A. Aphasic speakers use of definite and indefinite articles to mark given and new information in discourse. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1985.

Eisenson, J. Examining for Aphasia. New York: The Psychological Corporation, 1954.

Foldi, N. S., Cicone, M., and Gardner, H. Pragmatic aspects of communication in brain-damaged patients. In S. J. Segalowitz (Ed.) Language Functions and Brain Organization. New York: Academic Press, 1983.

Goldberg, G. Principles of rehabilitation of the elderly stroke patient. In R. E. Dunkle and J. W. Schmidley (Eds.) Stroke in the Elderly: New Issues in Diagnosis, Treatment, and Rehabilitation. New York: Springer Publishing Co., 1987.

Golper, L., Thorpe, P., Tompkins, C., Marshall, R., and

Rau, M. Connected language sampling: An expanded index of aphasic language behavior. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1980.

Goodglass, H. and Kaplan, E. The Assessment of Aphasia and Related Disorders. Philadelphia: Lea and Febiger, 1972.

Gurland, G. B., Chwat, S. E., and Wollner, S. G. Establishing a communication profile in adult aphasia: Analysis of communicative acts and conversational sequences. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1984.

Hagan, C. Communication abilities in hemiplegia: Effects of speech therapy. Archives of Physical Medicine and Rehabilitation, 54, 454-465, 1973.

Halliday, M. A. K. and Hasan, R. Cohesion in English. London: Longman, 1975.

Halpern, H., Darley, F. L., and Brown, J. R. Differential language and neurologic characteristics in cerebral involvement. Journal of Speech and Language Disorders, 38, 162-173, 1973.

Hartman, J. and Landau, W. M. Comparison of formal language therapy with supportive counseling for aphasia due to acute vascular accident. Archives of Neurology, 44, 646-649, 1987.

Holland, A. L. Communicative Abilities in Daily Living. Baltimore: University Park Press, 1980.

Holland, A. L., Swindell, C. S., and Forbes, M. M. The evolution of initial global aphasia: Implications for prognosis. In R. H. Brookshire (Ed.) Clinical aphasiology conference proceedings. Minneapolis: BRK Publishers, 1985.

Holland, A. L., Miller, J., Reinmuth, O. M., Bartlett, C., Fromm, D., Pashek, G., Stein, D., and Swindell, C. Rapid recovery from aphasia: A detailed language analysis. Brain and Language, 24, 156-173, 1985.

Hunt, K. Grammatical Structures Written at Three Grade Levels. Research report No. 3. Champaign,

Illinois: National Council of Teachers of English, 1965.

Hunt, K. Syntactic Maturity in School Children and Adults. Monographs of the society for research in child development, 35, Serial No. 134, 1970.

Jenkins, J. J., Jimenez-Pabon, E., Shaw, R. E., and Sefer, J. W. Schuell's Aphasia in Adults: Diagnosis, Prognosis, and Treatment, 2nd Ed. Hagerstown: Harper and Row Publishers, 1975.

Kempler, D., Curtiss, S., and Jackson, C. Syntactic preservation in Alzheimer's Disease. Journal of Speech and Hearing Research, in press.

Kenin, M. and Swisher, L. P. A study of pattern of recovery in aphasia. Cortex, 8, 56-68, 1972.

Kertesz, A. The Western Aphasia Battery. New York: Grune and Stratton, 1982.

Kertesz, A. and McCabe, P. Recovery patterns and prognosis in aphasia. Brain, 100, 1-18, 1977.

Kreindler, A., Calavrezo, C., and Mihailescu, L. Linguistic analysis of one case of jargon aphasia. Revue Roumaine de Neurologie, 8, 209-228, 1971.

LaPointe, L. L. Aphasia therapy: Some principles and strategies for treatment. In D. F. Johns (Ed.) Clinical Management of Neurogenic Communicative Disorders. Boston: Little, Brown and Company, 1985.

LaPointe, L. L. and Horner, J. Reading Comprehension Battery for Aphasia. Trigard, Oregon: C. C. Publications, Inc., 1979.

Leech, G. N. Principles of Pragmatics. London: Longman, 1983.

Lemme, M. L., Hedberg, N. L., and Bottenberg, D. E. Cohesion in narratives of aphasic adults. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1984.

Lendrem, W. and Lincoln, N. B. Spontaneous recovery of language in patients with aphasia between 4 and 34 weeks after stroke. Journal of Neurology, Neurosurgery, and Psychiatry, 48, 743-748, 1985.

Leonard, L. B., Prutting, C. A., Perozzi, J. A., and Berkley, R. K. Nonstandardized approaches to the assessment of language behaviors. Asha, 20, 371-379, 1978.

Lesser, R. Linguistic Investigations of Aphasia. New York: Elsevier, 1978.

Levinson, S. C. Pragmatics. Cambridge: Cambridge University Press, 1983.

Linebaugh, C. W. Assessing the assessments: The adequacy of standardized tests of aphasia. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1979.

Ludlow, C. L. Recovery from aphasia: A foundation for treatment. In M. Sullivan and M. S. Kommers (Eds.) Rationale for Adult Aphasia Therapy. University of Nebraska Medical Center, 1977.

Marshall, J. C. The description and interpretation of aphasic language disorder. Neuropsychologia, 24, 5-24, 1986.

Martin, A. D. Aphasia testing: A second look at the Porch index of communicative ability. Journal of Speech and Hearing Disorders, 42, 547-52, 1977.

McNeil, M. R. The nature of aphasia in adults. In N. J. Lass, L. V. McReynolds, J. L. Northern, and D. E. Yoder (Eds.) Speech, Language and Hearing, Vol. II: Pathologies of Speech and Language. Philadelphia: W. B Saunders Co., 1982.

McNeil, M. R. and Prescott, T. E. Revised Token Test. Baltimore: University Park Press, 1978.

McTear, M. F. Pragmatic disorders: A question of direction. British Journal of Disorders of Communication, 20, 119-127, 1985.

Meikle, M., Wechsler, E., Tupper, A., Benenson, M., Butler, J., Mulhall, D., and Stern, G. Comparative trial of volunteer and professional treatments of dysphasia after stroke. British Medical Journal, 2, 87-89, 1979.

Myerson, R. and Goodglass, H. Transformational grammars of three agrammatic patients. Language and Speech,

15, 40-50, 1972.

Nation, J. E. and Aram, D. M. Diagnosis of Speech and Language Disorders. St. Louis: The C. V. Mosby Company, 1977.

Nation, J. E. and Corlew, M. M. Aphasia tests: Differences among naming tasks. Archives of Physical Medicine and Rehabilitation, 55, 228-231, 1974.

Needham, L. S. and Swisher, L. P. A comparison of three tests of auditory comprehension for adult aphasics. Journal of Speech and Hearing Disorders, 37, 123-131, 1972.

Nespoulous, J-L. and Lecours, A. R. Clinical description of aphasia: Linguistic aspects. In D. Caplan, A. R. Lecours, and A. Smith (Eds.) Biological Perspectives on Language. Cambridge: The MIT Press, 1984.

Nicholas, M., Obler, L. K., Albert, M. L. and Helm-Estabrooks, N. Empty speech in Alzheimer's disease and fluent aphasia. Journal of Speech and Hearing Research, 28, 405-410, 1985.

Ochs, E. Planned and unplanned discourse. In E. Ochs and B. B. Schieffelin (Eds.) Acquiring Conversational Competence. London: Routledge and Kegan Paul, 1983.

Orgass, B. and Poeck, K. Assessment of aphasia by psychometric methods. Cortex, 5, 317-330, 1969.

Penn, C. Syntactic and pragmatic aspects of aphasic language. Johannesburg, South Africa: University of the Witwatersrand, Dissertation, 1983.

Penn, C. and Behrmann, M. Towards a classification scheme for aphasic syntax. British Journal of Disorders of Communication, 21, 21-38, 1986.

Piehler, M. F. and Holland, A. L. Cohesion in aphasic language. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1984.

Porch, B. E. Porch Index of Communicative Ability. Palo Alto, California: Consulting Psychologists Press, 1967.

Prins, R. S., Snow, C. E., and Wagenaar, R. Recovery from aphasia: Spontaneous speech versus language comprehension. Brain and Language, 6, 192-211, 1978.

Prutting, C. A. and Kirchner, D. M. Applied pragmatics. In T. M. Gallagher and C. A. Prutting (Eds.) Pragmatic Assessment and Intervention Issues in Language. San Diego: College-Hill Press, 1983.

Prutting, C. A. and Kirchner, D. M. A clinical appraisal of the pragmatic aspects of language. Journal of Speech and Hearing Disorders, 52, 105-119, 1987.

Quinteros, B., Williams, D. R. R., White, C. A. M., and Pickering, M. The costs of using trained and supervised volunteers as part of a speech therapy service for dysphasic patients. British Journal of Disorders of Communication, 19, 205-212, 1984.

Quirk, R., Greenbaum, S., Leech, G., and Svartvik, J. A Grammar of Contemporary English. London: Longman, 1972.

Rosenbek, J. Wrinkled feet. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1979.

Saffran, E. M., Schwartz, M. F., and Martin, O. S. M. Evidence from aphasia: Isolating the components of a production. In B. Butterworth (Ed.) Language Production: Speech and Talk, Vol. 1. London: Academic Press, 1980.

Sarno, M. T. Recovery and rehabilitation in aphasia. In M. T. Sarno (Ed.) Acquired Aphasia. New York: Academic Press, 1981.

Sarno, M. T. and Levita, E. Natural course of recovery in severe aphasia. Archives of Physical Medicine and Rehabilitation, 52, 175-179, 1971.

Sarno, M. T., Silverman, M., and Sands, E. Speech therapy and language recovery in severe aphasia. Journal of Speech and Hearing Research, 13, 607-623, 1970.

Scheull, H. Minnesota Test for Differential Diagnosis of Aphasia. Minneapolis: University of Minnesota,

1965.

Searle, J. Speech acts: An essay in the philosophy of language. London: Cambridge University Press, 1969.

Sheehan, V. M. Rehabilitation of aphasics in an army hospital. Journal of Speech and Hearing Disorders, 11, 149-157, 1946.

Shewan, C. M. and Kertesz, A. Effects of speech and language treatment on recovery from aphasia. Brain and Language, 23, 272-299, 1984.

Siegel, G. The use of language tests. Language, Speech and Hearing Services in Schools, 4, 211-217, 1975.

Spreen, O. and Benton, A. L. Neurosensory Center Comprehensive Examination for Aphasia. Victoria, B. C.: University of Victoria, 1969.

Spreen, O. and Risser, A. Assessment of aphasia. In M. T. Sarno (Ed.) Acquired Aphasia. New York: Academic Press, 1981.

Spreen, O. and Wachal, R. S. Psycholinguistic analysis of aphasic language: Theoretical formulations and precedures. Language and Speech, 16, 130-146, 1973.

Taylor, M. L. A measurement of functional communication in aphasia. Archives of Physical Medicine and Rehabilitation, 46, 101-107, 1965.

Ulatowska, H. K., Doyel, A. W., Freedman-Stern, R., Macaluso-Haynes, S., and North, A. J. Production of procedural discourse in aphasia. Brain and Language, 18, 315-341, 1983a.

Ulatowska, H. K., Freedman-Stern, R., Doyel, A. W., Macaluso-Haynes, S., and North, A. J. Production of narrative discourse in aphasia. Brain and Language, 19, 317-334, 1983b.

Ulatowska, H. K., Haynes, S. M., Hildebrand, B. H., and Richardson, S. M. The aphasic individual: A speaker and a listener, not a patient. In R. H. Brookshire (Ed.) Clinical Aphasiology Conference Proceedings. Minneapolis: BRK Publishers, 1977.

Vignolo, L. A. Evolution of aphasia and language

rehabilitation: A retrospective exploratory study. Cortex, 1, 344-367, 1964.

Voinescu, I. Syntactic complexity in aphasics. Revue Roumaine de Neurologie, 8, 69-80, 1971.

Wagenaar, E., Snow, C., and Prins, R. Spontaneous speech of aphasic patients: A psycholinguistic analysis. Brain and Language, 2, 281-303, 1975.

Wepman, J. M. Aphasia: Language without thought or though without language. Asha, 18, 131-136, 1976.

Wepman, J. M. Aphasia therapy: A new look. Journal of Speech and Hearing Disorders, 37, 203-214, 1972.

Wepman, J. M. and Jones, L. V. The Language Modalities Test for Aphasia. Chicago: University of Chicago, 1961.

Wertz, R. T., Collins, M. J., Weiss, D., Kurtzke, J. F., Friden, T., Brookshire, R. H., Pierce, J., Holtzapple, P., Hubbard, D. J., Porch, B. E., West, J. A., Davis, L., Matovitch, V., Morley, G. K., and Resurreccion, E. Veterans Administration cooperative study on aphasia: A comparison of individual and group treatment. Journal of Speech and Hearing Research, 24, 580-594, 1981.

Wertz, R. T., Kitselman, K. P., Deal, L. A., Collins, M. J., Weiss, D., Kurtzke, J. F., Friden, T., Brookshire, R. H., Pierce, J., Holtzapple, P., Hubbard, D. J., Porch, B. E., West, J. A., Davis, L., Matovitch, V., Morley, G. K., and Resurreccion, E. Classifying the aphasias: Contributions to patient management. London, Ontario: Paper presented to the Academy of Aphasia, 1981.

Wertz, R. T., LaPointe, L. L., Weiss, D. G., Holland, A. L., Brookshire, R. H., Aten, J. L., Kurtzke, J. F., Garcia-Bunuel, L., Milianti, F. J., Brannegan, R., Greenbaum, H., Marshall, R. C., Vogel, D., Carter, J. E., Barnes, N. S., and Goodman, R. Veterans Administration coooperative study on aphasia: Comparison of clinic, home, and deferred treatment. Archives of Neurology, 43, 653-658, 1986.

Yorkston, K. M. and Beukelman, D. R. An analysis of connected speech samples of aphasic and normal speakers. Journal of Speech and Hearing Disorders, 45, 27-36, 1980.

APPENDICES

APPENDIX A

T-UNIT ILLUSTRATION BY HUNT (1965)

T-UNIT ANALYSIS

According to Hunt (1970), a T-unit or "minimal terminal unit" segments a passage of speech "into the shortest units which it is grammatically allowable to punctuate as sentences" (p.4). The following sample was provided by Hunt (1965) to illustrate how to segment a passage into T-units (pg 20-21):

> I like the movie we saw about Moby Dick the white whale the captain said if you can kill the white whale Moby Dick I will give this gold to the one that can do it and it is worth sixteen dollars they tried and tried but while they were trying they killed a whale and used the oil for the lamps they almost caught the white whale.

Hunt sequentially numbered each T-unit and used a slated line to indicate the beginning of each new clause:

1. I like the movie / we saw about Moby Dick the white whale

2. the captain said / if you can kill the white whale Moby Dick / I will give this gold coin to the one / that can do it

3. and it is worth sixteen dollars

4. they tried and tried

5. but while they were trying / they killed a whale and used the oil for the lamps

6. they almost caught the white whale

In this sample there are six T-units. Clauses per T-unit are 2/1, 4/1, 1/1, 1/1, 2/1 and 1/1 or an average ratio of 1.83. Words per T-unit are: 11/1, 24/1, 6/1, 4/1, 16/1, and 6/1 or an average ratio of 11.16. Words per clause are 4/1, 8/1, 3/1, 9/1, 9/1, 4/1, 6/1, 4/1, 5/1, 11/1, and 6/1 or an average ratio of 6.28.

APPENDIX B

FORMAL INDICATORS OF SUBORDINATION

FORMAL INDICATORS OF SUBORDINATION

Simple Subordinators

after, (al)though, as, because, before, but (that), if, how(ever), like (familiar), once, since, that, till, unless, until, when(ever), where(ver), whereas, whereby, whereupon, while

Compound Subordinators

ending with <u>that</u>:

in that, so that, in order that, such that, except that, for all that, save that

ending with optional <u>that</u>:

now (that), providing (that), provided (that), supposing (that), considering (that), given (that), granting (that), granted (that), admitting (that), assuming (that), presuming (that), seeing (that), immediately (that), directly (that)

ending with <u>as</u>:

as far as, as long as, as soon as, so long as, insofar as, so far as, inasmuch as, according as, so as (+ to + infinitive)

ending with <u>than</u>:

sooner than (+ infinitive), rather than (+ infinitive)

other:

as if, as though, in case

Correlative Subordinators

1. if. . .then, (al)though. . .yet/nevertheless, as. . .so
2. more/-er/less. . .than, as. . .as, so. . .as, so. . .(that), such. . .as, such. . .(that), no sooner. . .than
3. whether. . .or
4. the. . .the

(pg. 727-728, Quirk et al.)

APPENDIX C

EXAMPLES OF SYNTACTIC ERRORS

SYNTACTIC RATINGS

1) Verb Tense/Concord Errors

"but she like company"

Dialectical forms are not considered error, e.g.

"we seen them"

2) Obligatory Word Omissions

"my boy * sixteen"

"she said she's going * wait"

Ellipsis of word(s) permitted if word(s) recoverable from the context, e.g.

C: where are you going on your vacation?
P: going to Vancouver

3) Addition of Extra Elements

"she must to know everbody around here"

4) Incomplete

"I don't think but it's"

Connective/subordinator acceptable as final word if patient is interrupted or if it is stylistic, e.g.

"I might be going or"

5) Plural Errors

"comb the hairs"

"not much because there's another dogs that bark"

6) Pronoun Errors

"her hair's pretty shiny" (her/his)

7) Word Order Errors

"I know what is it"

8) Topicalization - rated as "-" if it's awkward

"this is 25 cents uh American form of coins"

9) Paraphasias that indicate an appropriate word function are to be counted as correct

APPENDIX D

EXAMPLES OF SEMANTIC ERRORS

SEMANTIC RATINGS

1) Vague/Empty Vocabulary

"you just master another key with it"

"you just pick out the dry parts of the fork"

2) Given/New Information

"Betty took her down there" (no referent)

"it is everything" (no referent)

3) Paraphasias

"no mostly out uh in rin pin"

4) Inaccurate Information

"I got two daughters" (patient has no children)

5) Ambiguous/Without Content

"and she seemed to be jumping that boat she took right out herself"

"I just wa and wa"

6) Inappropriate Lexical Choice

"I don't use it to match myself" (matches)

7) Incomplete

"well I hadn't been doing my"

APPENDIX E

DEFINITIONS OF PRAGMATIC BEHAVIORS

Definitions for Communicative Behaviors Assessed Using the Pragmatic Protocol (Prutting and Kirchner, 1987):

Verbal Aspects

Speech act pair analysis: the ability to take both speaker and listener role appropriate to the context.

Variety of speech acts: the variety of speech acts or what one can do with language such as comment, assert, request, promise, etc.

Topic selection: the selection of a topic appropriate to the multidimensional aspects of context.

Topic introduction: introduction of a new topic in the discourse.

Topic maintenance: coherent maintenance of topic across the discourse.

Topic change: change of topic in the discourse.

Turntaking initiation: initiation of speech acts.

Turntaking response: responding as a listener to speech acts.

Turntaking repair/revision: the ability to repair a conversation when a breakdown occurs, and the ability to ask for a repair when misunderstanding or ambiguity has occurred.

Turntaking pause time: pause time that is too short or too long between words, in response to a question, or between sentences.

Turntaking interruption/overlap: interruptions between speaker and listener; overlap refers to two people talking at once.

Turntaking feedback to listener: verbal behavior to give the listener feedback such as "yeah" and "really"; nonverbal behavior such as head nods to show positive reactions and side to side to express negative effects or disbelief.

Turntaking adjacency: utterances that occur immediately after the partner's utterance.

Turntaking contingency: utterances that share the same topic with a preceding utterance and that add information to the prior communicative act.

Turntaking quantity/conciseness: the contribution should be as informative as required but not too informative.

Specificity/accuracy: lexical items of best fit considering the text.

Cohesion: The recognizable unity or connectedness of text.

Paralinguistic Aspects

Intelligibility: the extent to which the message is understood.

Vocal intensity: the loudness or softness of the message.

Vocal quality: the resonance and/or laryngeal characteristics of the vocal tract.

Prosody: the intonation and stress patterns of the message; variations of loudness, pitch, and duration.

Fluency: the smoothness, consistency, and rate of the message.

Nonverbal Aspects

Physical proximity: the distance that the speaker and listener sit or stand from one another.

Physical contacts: the number of times and placement of contacts between speaker and listener.

Body posture: forward lean is when the speaker or listener moves away from a 90-degree angle toward the other person; recline is slouching down from waist and moving away from the partner ; side to side is when a person moves to the right or left.

Foot/leg and hand/arm movements: any movement of the foot/leg or hand/arm.

Gestures: any movements that support, complement, or replace verbal behavior.

Facial expression: a positive expression as in the corners of the mouth turned upward; a negative expression is a downward turn; a neutral expression is the face in resting position.

Eye gaze: one looks directly at the other's face; mutual gaze is when both members of the dyad look at the other.

APPENDIX F

TRANSCRIPTION NOTATIONS

TRANSCRIPTION INSTRUCTIONS

1. At the top of each sheet, fill out as follows:

   Patient ___ Page __/__
   Fluent or Nonfluent

   Conversation or PICA Subtest 1

2. Number each line of transcription. For example:

   1 C: Did you have breakfast early?

   2 P: yeah. ya-yeah

3. Code clinician as "C"
   Code patient as "P"

4. Transcription Notations:

   [ ] unintelligible or questionable utterances

   ? at the end of a question

   (( )) for PICA objects if description is questionable or for any gestures or contextual cues that are important to the transcription

   = false starts or revised utterances

5. Any reference to a patient's name should be transcribed as Mr. __ (initial of patient's name)

APPENDIX G

INDIVIDUAL SUBJECT DATA FOR CONVERSATION

INDIVIDUAL SUBJECT DATA FOR CONVERSATION

SS/TIME*	T-UNITS	CLAUSES	WORDS	C/T*	W/T*	W/C*	SYN%*	SEM%*	PRA%*
102/ 4	3	3	10	1.00	3.33	3.33	67	67	90
15	14	16	67	1.14	4.79	4.19	71	79	90
26	16	18	81	1.13	5.06	4.50	62	94	93
37	11	12	58	1.09	5.27	4.83	64	100	100
48	25	28	179	1.12	7.16	6.39	60	84	90
105/ 4	50	69	335	1.38	6.70	4.86	56	74	86
15	28	48	235	1.71	8.39	4.90	50	100	90
26	39	54	279	1.39	7.15	5.17	51	95	90
37	47	65	331	1.38	7.04	5.09	45	77	90
48	51	71	378	1.39	7.41	5.32	55	94	90
106/ 4	43	62	315	1.44	7.33	5.08	58	60	93
15	27	35	195	1.30	7.22	5.57	70	74	90
26	22	31	148	1.41	6.73	4.77	82	86	93
37	25	32	191	1.28	7.64	5.97	84	76	90
48	17	19	114	1.12	6.71	6.00	71	94	97
201/ 4	3	3	10	1.00	3.33	3.33	33	0	86
15	12	13	62	1.08	5.17	4.77	50	67	93
26	26	30	161	1.15	6.19	5.37	81	88	93
37	18	22	138	1.22	7.67	6.27	71	94	93
48	24	29	175	1.21	7.29	6.03	79	100	100
202/ 4	2	2	9	1.00	4.50	4.50	100	100	79
15	2	2	4	1.00	2.00	2.00	0	0	83
26	0	0	0	0.00	0.00	0.00	X	X	83
37	2	2	6	1.00	3.00	3.00	50	50	83
48	3	3	7	1.00	2.33	2.33	33	33	83
203/ 4	2	2	7	1.00	3.50	3.50	50	50	83
15	17	21	99	1.24	5.82	4.71	35	23	79
26	10	10	48	1.00	4.80	4.80	80	10	83
37	7	7	35	1.00	5.00	5.00	14	14	86
48	4	4	20	1.00	5.00	5.00	100	25	86
206/ 4	17	24	114	1.41	6.71	4.75	65	88	97
15	14	17	115	1.21	8.21	6.77	71	93	93
26	33	41	224	1.24	6.79	5.46	79	94	97
37	7	16	76	2.29	10.86	4.75	71	100	100
48	5	6	24	1.20	4.80	4.00	80	100	100
208/ 4	11	11	78	1.00	7.09	7.09	73	100	90
15	5	9	48	1.80	9.60	5.33	40	80	93
26	9	9	57	1.00	6.33	6.33	100	100	86
37	10	14	90	1.40	9.00	6.43	70	70	90
48	18	25	161	1.39	8.94	6.44	83	100	90

SS/TIME*	T-UNITS	CLAUSES	WORDS	C/T*	W/T*	W/C*	SYN%*	SEM%*	PRA%*
209/ 4	25	37	197	1.48	7.88	5.32	80	92	93
15	21	33	192	1.57	9.14	5.82	76	81	97
26	39	56	341	1.44	8.74	6.09	69	82	97
37	21	30	151	1.43	7.19	5.03	76	95	100
48	34	65	338	1.91	9.94	5.20	68	82	97
215/ 4	72	136	694	1.89	9.64	5.10	69	56	86
15	86	135	750	1.57	8.72	5.56	78	84	93
26	23	37	214	1.61	9.30	5.78	87	91	93
37	34	62	340	1.82	10.00	5.48	79	88	97
48	38	67	341	1.76	8.97	5.09	76	92	97
218/ 4	13	21	132	1.62	10.15	6.29	61	31	83
15	23	33	177	1.44	7.70	5.36	74	65	93
26	25	34	217	1.36	8.68	6.38	76	64	90
37	22	31	181	1.41	8.23	5.84	95	82	93
48	16	28	180	1.75	11.25	6.43	62	62	93
219/ 4	10	10	51	1.00	5.10	5.10	30	40	90
15	10	12	68	1.20	6.80	5.67	50	70	97
26	13	16	85	1.23	6.54	5.31	77	85	90
37	6	8	40	1.33	6.67	5.00	83	100	90
48	13	19	99	1.46	7.62	5.21	69	92	93
301/ 4	28	43	267	1.54	9.54	6.21	64	82	93
15	34	54	334	1.59	9.82	6.19	76	91	93
26	35	58	328	1.66	9.37	5.66	66	83	93
37	30	41	238	1.37	7.93	5.81	70	67	90
48	22	38	196	1.73	8.91	5.16	73	77	90
401/ 4	29	34	175	1.17	6.03	5.15	93	93	90
15	33	50	229	1.52	6.94	4.58	70	88	97
26	35	45	279	1.29	7.97	6.20	71	97	93
37	24	31	146	1.29	6.08	4.71	83	96	97
48	15	24	115	1.60	7.67	4.79	80	100	100
408/ 4	6	7	27	1.17	4.50	3.86	67	83	83
15	11	15	80	1.36	7.27	5.33	54	54	86
26	14	17	111	1.21	7.93	6.53	43	71	93
37	22	24	118	1.09	5.36	4.92	68	86	93
48	30	34	162	1.13	5.40	4.77	53	70	86
411/ 4	0	0	0	0.00	0.00	0.00	X	X	83
15	7	8	31	1.14	4.43	3.88	86	100	93
26	6	7	35	1.17	5.83	5.00	83	100	90
37	2	2	15	1.00	7.50	7.50	50	100	90
48	10	13	63	1.30	6.30	4.85	80	80	93

SS/TIME*	T-UNITS	CLAUSES	WORDS	C/T*	W/T*	W/C*	SYN%*	SEM%*	PRA%*
416/ 4	31	44	329	1.42	10.61	7.48	58	42	86
15	39	65	386	1.67	9.90	5.94	69	51	93
26	14	16	93	1.14	6.64	5.81	71	79	97
37	26	40	258	1.54	9.92	6.54	54	65	97
48	10	12	71	1.20	7.10	5.92	50	90	100
417/ 4	6	9	34	1.50	5.67	3.78	83	100	93
15	13	17	110	1.31	8.46	6.47	77	100	97
26	17	30	163	1.77	9.59	5.43	59	100	97
37	22	41	226	1.86	10.27	5.51	54	86	97
48	14	22	129	1.57	9.21	5.86	71	71	97
506/ 4	0	0	0	0.00	0.00	0.00	X	X	72
15	1	1	1	1.00	1.00	1.00	0	0	76
26	1	1	1	1.00	1.00	1.00	0	0	79
37	0	0	0	0.00	0.00	0.00	X	X	79
48	1	1	1	1.00	1.00	1.00	0	100	83
507/ 4	8	9	39	1.12	4.88	4.33	87	100	93
15	19	22	120	1.16	6.32	5.45	100	95	97
26	7	8	48	1.14	6.86	6.00	86	71	97
37	6	6	26	1.00	4.33	4.33	83	100	90
48	6	8	31	1.33	5.17	3.87	83	100	93

KEY: TIME - 4, 15, 26, 37, 48 Weeks Postonset
C/T - Ratio of clauses and T-unit
W/T - Ratio of words and T-unit
W/C - Ratio of words and clauses
SYN% - Percentage of syntactically well-formed utterances
SEM% - Percentage of semantically appropriate utterances
PRAG% - Percentage of pragmatically appropriate behaviors
X - No T-units were produced

APPENDIX H

INDIVIDUAL SUBJECT DATA FOR PICA SUBTEST I

INDIVIDUAL SUBJECT DATA FOR PICA SUBTEST I

SS/TIME*	T-UNITS	CLAUSES	WORDS	C/T*	W/T*	W/C*	SYN%*	SEM%*	PICA*
102/ 4	15	18	62	1.20	4.13	3.44	33	80	43
15	7	7	29	1.00	4.14	4.14	71	86	51
26	11	15	70	1.36	6.36	4.67	27	91	55
37	12	14	53	1.17	4.42	3.79	58	75	62
48	13	20	85	1.54	6.54	4.25	54	85	60
105/ 4	15	21	101	1.40	6.73	4.81	53	73	50
15	12	12	51	1.00	4.25	4.25	58	92	72
26	9	12	61	1.33	6.78	5.08	56	67	61
37	15	17	83	1.13	5.53	4.88	73	80	65
48	12	13	68	1.08	5.67	5.23	92	92	64
106/ 4	47	54	237	1.15	5.04	4.39	49	53	72
15	18	19	94	1.06	5.22	4.95	39	78	79
26	18	19	105	1.06	5.83	5.53	72	94	82
37	16	21	82	1.31	5.13	3.91	81	81	83
48	15	18	68	1.20	4.53	3.78	67	73	89
201/ 4	6	6	19	1.00	3.17	3.17	17	33	42
15	24	25	88	1.04	3.67	3.52	58	75	65
26	22	29	133	1.32	6.05	4.59	68	64	77
37	12	17	95	1.42	7.92	5.59	75	50	79
48	19	24	125	1.26	6.58	5.21	74	68	85
202/ 4	3	3	4	1.00	1.33	1.33	0	0	15
15	2	2	9	1.00	4.50	4.50	100	50	15
26	0	0	0	0.00	0.00	0.00	X	X	13
37	0	0	0	0.00	0.00	0.00	X	X	20
48	0	0	0	0.00	0.00	0.00	X	X	32
203/ 4	4	4	15	1.00	3.75	3.75	100	0	16
15	34	46	207	1.35	6.09	4.50	41	9	36
26	36	50	215	1.39	5.97	4.30	47	0	39
37	15	16	76	1.07	5.07	4.75	53	0	40
48	16	18	75	1.13	4.69	4.17	50	0	42
206/ 4	14	17	100	1.21	7.14	5.88	93	93	60
15	16	23	100	1.44	6.25	4.35	81	94	80
26	10	13	81	1.30	8.10	6.23	80	90	71
37	11	15	82	1.36	7.46	5.47	100	100	78
48	11	11	86	1.00	7.82	7.82	73	91	82
208/ 4	19	25	93	1.32	4.90	3.72	63	89	66
15	10	13	35	1.30	3.50	2.69	60	90	68
26	10	11	29	1.10	2.90	2.64	80	100	72
37	10	15	45	1.50	4.50	3.00	80	90	64
48	11	12	40	1.09	3.64	3.33	73	91	63

SS/TIME*	T-UNITS	CLAUSES	WORDS	C/T*	W/T*	W/C*	SYN%*	SEM%*	PICA*
209/ 4	14	15	73	1.07	5.21	4.87	93	79	73
15	19	21	108	1.11	5.68	5.14	95	100	89
26	16	23	138	1.44	8.63	6.00	69	75	89
37	11	11	72	1.00	6.55	6.55	100	100	89
48	12	30	145	2.50	12.08	4.83	92	100	95
215/ 4	63	102	589	1.62	9.35	5.78	70	46	44
15	38	54	250	1.42	6.58	4.63	87	66	74
26	19	30	140	1.58	7.37	4.67	95	74	77
37	21	30	124	1.43	5.91	4.13	81	100	80
48	12	17	103	1.42	8.58	6.06	83	92	80
218/ 4	26	38	206	1.46	7.92	5.42	69	46	49
15	20	30	136	1.50	6.80	4.53	65	75	53
26	19	23	119	1.21	6.26	5.17	74	74	64
37	15	18	97	1.20	6.47	5.39	93	73	67
48	12	19	95	1.58	7.92	5.00	58	83	70
219/ 4	28	30	116	1.07	4.14	3.87	71	68	55
15	11	12	41	1.09	3.73	3.42	64	91	72
26	11	13	46	1.18	4.18	3.54	54	73	68
37	10	11	41	1.10	4.10	3.73	80	70	70
48	12	14	51	1.17	4.25	3.64	67	75	62
301/ 4	22	24	147	1.09	6.68	6.13	73	36	58
15	16	18	117	1.13	7.31	6.50	87	81	90
26	10	10	85	1.00	8.50	8.50	80	80	89
37	21	30	181	1.43	8.62	6.03	86	81	90
48	14	14	102	1.00	7.29	7.29	71	86	91
401/ 4	36	59	301	1.64	8.36	5.10	50	17	49
15	45	92	450	2.04	10.00	4.89	60	93	88
26	23	38	151	1.65	6.57	3.97	65	83	90
37	26	32	186	1.23	7.15	5.81	77	96	91
48	12	14	59	1.17	4.92	4.21	83	100	89
408/ 4	15	17	55	1.13	3.67	3.24	73	67	35
15	25	34	137	1.36	5.48	4.03	48	72	53
26	19	24	99	1.26	5.21	4.13	32	84	58
37	17	20	74	1.18	4.35	3.70	53	59	65
48	14	22	83	1.57	5.93	3.77	43	64	63
411/ 4	2	2	3	1.00	1.50	1.50	0	0	39
15	10	11	57	1.10	5.70	5.18	90	90	52
26	9	16	49	1.78	5.44	3.06	100	89	54
37	10	10	61	1.00	6.10	6.10	100	100	65
48	10	11	70	1.10	7.00	6.36	100	100	67

SS/TIME*	T-UNITS	CLAUSES	WORDS	C/T*	W/T*	W/C*	SYN%*	SEM%*	PICA*
416/ 4	21	35	171	1.67	8.14	4.89	43	38	26
15	18	27	129	1.50	7.17	4.78	61	67	44
26	16	21	86	1.31	5.38	4.10	75	81	43
37	11	23	120	2.09	10.91	5.22	64	91	43
48	15	15	88	1.00	5.87	5.87	67	80	42
417/ 4	11	18	82	1.64	7.46	4.56	73	82	47
15	10	21	94	2.10	9.40	4.48	60	100	85
26	10	19	80	1.90	8.00	4.20	70	90	89
37	11	22	95	2.00	8.64	4.32	82	91	93
48	11	16	73	1.46	6.64	4.56	100	100	92
506/ 4	0	0	0	0.00	0.00	0.00	X	X	15
15	2	2	2	1.00	1.00	1.00	0	0	37
26	0	0	0	0.00	0.00	0.00	X	X	50
37	1	1	1	1.00	1.00	1.00	0	100	50
48	5	5	9	1.00	1.80	1.80	20	60	59
507/ 4	18	25	138	1.39	7.67	5.52	72	50	19
15	20	22	100	1.10	5.00	4.55	95	90	37
26	10	12	45	1.20	4.50	3.75	80	80	53
37	19	21	88	1.11	4.63	4.19	63	79	58
48	11	11	64	1.00	5.82	5.82	73	73	57

Key: TIME - 4, 15, 26, 37, 48 Weeks Postonset
C/T - Ratio of clauses and T-units
W/T - Ratio of words and T-units
W/C - Ratio of words and clauses
SYN% - Percentage of syntactically well-formed utterances
SEM% - Percentage of semantically appropriate utterances
PICA - PICA overall percentile score
X - No T-units were produced