COVERBAL BEHAVIOR ELICITED BY APHASIC SUBJECTS DURING CONVERSATIONAL TURNS

By

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TABLE OF CONTENTS

TABLE OF CONTENTS - continued

LIST OF TABLES

LIST OF FIGURES

Abstract of Dissertation
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of the University of Florida
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The purpose of this study was to investigate whether or not aphasic speakers suffer a concurrent impairment in the use of coverbal behavior and to determine whether or not any relationship exists between linguistic impairment and output of coverbal behavior. Twenty adult males (10 aphasic and 10 non-brain-damaged normal speakers) were videotaped individually as they responded to 20 questions during face-to-face conversation. The 20 responses (speaking turns) of each subject were played back on a videotape monitor and 6 coverbal behaviors (eye contact, eyebrow raise, smile, head nod, head shake, head tilt) were measured as to their frequency and cumulative time of occurrence. Total speaking time of the 20 turns also was measured. Relative frequency

(rate) and cumulative time (duration) as well as the average duration of occurrence (average length) for each coverbal behavior were calculated, compared between groups of subjects, and for the aphasic subjects, compared with performance on standard language tests. The results indicate that aphasic speakers do not suffer a concurrent impairment in the use of coverbal behavior. In addition, some relationships may exist between output of coverbal behavior, auditory comprehension, and verbal output ability.

CHAPTER I

INTRODUCTION

Human communication can be reviewed as a system of interdependent channels over which information is transmitted through shared patterns of behavior (Table 1). The various functions of these channels are omnifarious, but include establishing and maintaining social order and adjustment. Interlocutors (speaker and listener) operate within all channels of communication simultaneously. While speech operates intermittently, producing obvious junctures, other "nonverbal" channels, such as kinesics, operate continuously, and in this sense it is not possible not to communicate.

> Although an individual can stop talking, he can not stop communicating through body idiom; he must say either the right thing or the wrong thing. He cannot say nothing. (Goffman, 1965, p. 35)

Language: Verbal Behavior

Human communication can be divided into language and nonlanguage behavior. Human language is a systematic relationship between distinct, arbitrary symbols (in systems of auditory, visual and tactile codes) and meaning (i.e., referents, e.g., objects, actions relations, ideas known by

Table 1

Major Channels of Communication during Conversation
(Markel, 1969)

INTERLOCUTOR A (SPEAKER)		INTERLUCUTOR B (LISTENER)
SOURCE	CHANNEL	DESTINATION
sound from the mouth	speech	ear
skin	touch	skin
changes on skin surface	observation	eyes
movement of body	kinesics	eyes
placement of body	proxemics	eyes
(various)	odor	nose

the members of a specific community. More simply stated, language refers to words and to those behaviors that are necessary to the articulatory and grammatical functioning of those words. For example, language behavior in the speech channel refers not only to the words uttered, but also to the use of prosody (e.g., stress and intonation) as it influences the phonemic, morphosyntactic, and semantic parameters of those words. The term language, therefore, is equated with verbal, in the same manner as defined by Skinner (1957), i.e., relating to words without regard for output modality (e.g., oral speech, writing, sign language). In no way should the term verbal be confused with speech; the former refers to the linguistic nature of the behavior while the latter refers to a channel of communication, of which the origin is the mouth and the destination is the ear.

Linguistic Organization

Language differs qualitatively from nonlanguage behavior in many ways. One major difference is the manner in which the units of language are organized. Linguistic organization refers to the hierarchy of rules governing the interrelation of the phonemic, morphosyntactic, and semantic levels of language. This unique relation permits the production of a limitless variety of novel communicative strings from a finite set of rules and phonemes and morphemes.

Several investigators (e.g., Sheflen, 1965; Birdwhistell, 1970) feel that nonlanguage behavior is organized by a rigid grammar similar to the linguistic organization of language, but the findings of other studies do not appear to support this conclusion. Ekman, Friesen, and Tomkins (1971) found that the rules governing the decoding of facial expressions operate contrary to the rules of language. By dividing the face into different components, the authors discovered that a single facial expression can be made up of anywhere from 8 (as in the case of surprise or fear) to 640 (for sadness) possible combinations of facial behavioral components. In contrast to this is the specified string of phonemes that must be united in only one order to form a particular word. The great variety in the combination of facial components is one strong indication that these behaviors are more loosely organized than the components of language.

In a related study, Kendon (1971) investigated the relation between verbal and nonverbal behavior by examining slow-motion films of interlocutors engaged in conversation. He found that the units of nonlanguage behavior (e.g., body movements) increase in size directly with concurrent increases in speech units. In addition, nonlanguage behaviors involved large increases in body area and/or extent of movement, and were not constructed simply from smaller behavioral units as is the case with language behavior. In summarizing these studies and related work by Birdwhistell

1970), Dittmann stated

> Body movements groups themselves into larger units by virtue of their relation to concurrent speech, not by virtue of any independent structural relationship among the movements themselves (1971, p. 341).

Nonlanguage: Nonverbal Behavior

Human communication that is not linguistic is collectively called nonverbal behavior. Birdwhistell stated that the phrase "nonverbal communication" is awkward and misleading, having "about the same amount of meaning as 'noncardiac physiology'" (1963, p. 130). For Birdwhistell and others sharing his holistic view of communication, the verbal-nonverbal dichotomy is not a valid distinction. Discrete channels are useful in describing the structure of communication, but do not provide an accurate representation of the integrative relationship existing among simultaneously occurring channels. The interaction among channels is an essential characteristic of human communication. Nevertheless, nonverbal behavior and nonverbal communication are areas of interest designated by researchers in communication (Weiner, DeVoe, Rubinow, and Geller, 1972). For these researchers nonverbal behavior refers to nonlinguistic behaviors that reflect emotional, cognitive and other ongoing processes (e.g., visceral) in the individual. Nonverbal communication refers to a subclass of nonverbal behavior that transmits information between interlocutors; thus, these behaviors are a part of a consensually shared code.

Coverbal Behavior

Few investigations of nonverbal behavior and nonverbal communication make use of common research perspectives. Studies differ in theoretical organization, basic methodology or in the type of information investigated, thereby impairing integration of the results. Currently, nonverbal communication is more accurately defined within the context of conversational interaction as coverbal behavior, and describes the behavior of interlocutors which occurs in association with or accompanying words, but which is not essential for the articulatory or grammatical functioning of those words (Markel, 1975). The study of coverbal behavior, therefore, is the investigation of all observable nonlinguistic communicative behaviors elicited by individuals engaged in conversation. Although by definition coverbal behavior includes several parameters of vocal behavior, only movements of the head and face were investigated in this study. These coverbal behaviors are communicated over the kinesic channel and represent communicative behavior that is exclusively paralinguistic, nonpropositional and that may operate at a less conscious level of functioning than does speech (LaBarre, 1947; Hall, 1959). The information communicated to the receiver by coverbal behavior is limited to affect and social factors regulating dyadic and larger group interaction, and therefore, is connotative to the information simultaneously transmitted on the speech channel.

Methodological Considerations

Unlike the term kinesics, which implies a nonstatistical, descriptive analysis of the communicative structure of social interaction (Vetter, 1969; Dittmann, 1971), the study of coverbal behavior does not embrace any one specific theoretical approach to the investigation of nonverbal communicative behavior. Coverbal behavior research, however, does designate spontaneous conversational interaction as the appropriate setting for the study of these nonlanguage behaviors. Man is a social animal (Sullivan, 1953) and face-to-face conversation is one of our most common means of social interaction (Cherry, 1968).

During conversation, interlocutors take turns speaking and listening. The speaking turn is a fundamental element of conversation and is generally accepted as the simplest and most reliable method of segmenting the behavioral stream of conversational interaction (Schegloff, 1968; Duncan, 1972; Markel, 1975). Interlocutors may briefly talk simultaneously ("simultaneous speech") or periods of silence may occur between speakers ("switching pause"), but the occurrence of these behaviors is merely one indication of the systematic rotation of speaking and listening roles between or among interlocutors (Feldstein, 1972, p. 95).

Interruptions of speech, however, do not interrupt the flow of coverbal behavior. Although an interlocutor's speech is segmented by periods of silence, coverbal behavior continues to occur as a constant stream of activity.

The concept of the turn, therefore, is essential to the analysis of coverbal behavior occurring in spontaneous conversational interaction.

In addition, the spontaneous quality of the conversation (and the subsequent turns) should be emphasized. Markel stressed that "a high level of informality should be a part of every research design studying conversational interaction" (1973, p. 6). By incorporating a casual and relaxed general mood for each subject, the probability becomes greater that the subject's behavior will be free from artificiality or affectations manifested by the experimental context and more realistically represent behavior elicited spontaneously by the subject under daily, nonexperimental conditions. Argyle (1972) recommended rigorously designed experiments which state hypotheses, but are performed in realistic settings with clearly defined social conventions; thus, all the salient elements of ordinary social behavior are contained in the experimental setting. Examples of experiments with these qualities include field experiments on unsuspecting people (with or without confederates) and laboratory experiments accurately simulating real-life situations where social conventions are familiar, such as interviews or discussions. Film or notation is used to record the occurrences of the behavior and statistical analysis applied to the data.

Communicative Significance

The fact that people do not communicate by words alone has been well noted for many years (Darwin, 1872; Sapir, 1927; Pittenger and Smith, 1957). Regardless of what is said, it is the parenthetical silent messages that define the social context of the spoken word. Knapp (1972) reported that Birdwhistell, a noted authority on nonverbal communication, estimated the average person speaks words for a total of about 10 minutes each day, while he is continually communicating nonverbally. While it is certainly true that all behavior could be considered to serve a communicative function (Weiner et al., 1972), it would be more useful to limit any investigation to those behaviors most observable during conversation (Markel, 1975).

The face and head are the parts of the body most visible to interlocutors during conversation (Argyle, 1969). Argyle (1972) reported that interlocutors looked intermittently at one another for 25% to 75% of the conversation. Markel (1975) stated that looking away from your partner during conversation is acceptable, but looking at any part of the body other than the face or head will probably disrupt the conversation. Ellsworth and Carlsmith (1968) found that an interlocutor will turn and look in the direction of his partner's gaze when that gaze is directed beyond the interlocutor's ear.

Whether consciously acknowledged or not, interlocutors exchange a variety of information via facial and head cues during face-to-face conversation. For example, research has shown that a head nod can serve as a positive reinforcer (Argyle, 1972), and as an instrumental affiliative act (Vetter, 1969), regulate turn-taking (Kendon, 1967; Dittmann and Llewellyn, 1969), reflect encoding and decoding processes (Dittmann, 1972), and coordinate the synchrony of behavior between interlocutors (Condon and Ogston, 1966 and 1967; Kendon, 1970). By using competing messages, Mehrabian and Ferris (1967) demonstrated that facial expressions provide more powerful affective information than vocal behavior. In summarizing his research on competing messages, Mehrabian (1968) estimated that 55% of a message's effect is communicated via facial cues, while 38% is communicated vocally and only 7% verbally. While studying deception and coverbal behavior, Ekman and Friesen (1969) found that the face serves as the major site for effect display, while movement of other parts of the body (e.g., the legs) indicates the intensity of the emotion.

Therapeutic Setting

The influences of coverbal behavior on the clinician-patient relationship has received an increasing amount of attention in recent years. Much of the research in this area has been done in psychiatric and psychotherapeutic settings where the objective was to "'read,' through some channel of communication other than words, how a subject feels at a given time" (Renneker and Dittmann, 1963, p. 140).

Consequentially, many premises and goals of the clinician-patient relationship in the psychotherapeutic setting differ significantly from those in speech pathology. Some similarities, however, do exist, and a review of several pertinent studies is indicated so that the role of coverbal behavior in the clinician-patient relationship may be better understood.

Several authors have identified parameters of interaction that they feel facilitate the clinician-patient relationship in the treatment setting. Carson (1969) stated that the effective nature of the interaction and the relative status of the interactants were critical to defining the nature of the relationship. Truax and Caruhuff (1967) reported three qualities of personality that they felt could assist a clinician in securing a positive relationship with a patient. The clinician should display accurate empathy (understanding), nonpossessive warmth (respect) and genuiness (authenticity). Vaughn and Burgoon (1976) presented an exhaustive review of the literature pertaining to the use and misuse of nonverbal communication in the therapeutic setting. They suggested systematic assessment of the effects of these behaviors on the patient's progress so that behaviors that aid the clinician in treatment could be encouraged, while behaviors judged to interfere with progress could be discontinued.

Although verbal messages can be the primary mode of communication between clinician and patient, concurrent coverbal messages will communicate most of the effect (Mehrabian, 1968) and thus modify the verbal messages accordingly. In relating feelings of sincerity and multiple levels of communication, Pittenger and Smith stated:

> When there is congruity of the overlapping elements, the communication is experienced as sincere, direct and without reservation. If any elements are incongruous or inconsistent, the skilled listener will hear or "feel" the disparity, but frequently will have only the vaguest idea of the source of his subjective response to the communication.(1957, p. 75)

Little empirical research has been done in speech pathology to determine the extent to which the clinician-patient relationship is affected by coverbal behavior. Changes in the frequency of occurrence of coverbal behavior during therapy appears to influence the effectiveness of a speech pathologist. Mercer and Schubert (1974) measured the coverbal behavior elicited by speech pathology graduate clinicians during treatment sessions. The frequency of occurrence of several coverbal behaviors were correlated with clinical ratings given the clinicians by their clinical supervisors. Clinicians rated higher by their supervisors elicited a greater amount of coverbal behavior than those clinicians rated lower during two 5 minute segments of the treatment session. Head nods, eye contacts and smiles were found to demonstrate the greatest difference. Unfortunately, rather than utilizing an objective measurement of effectiveness [e.g., treatment progress, or the Boone-Prescott (1972) system], the clinical evaluations were subjective ratings and may simply reflect the afflia-tive behavior elicited by the clinicians (i.e., head nods, eye contacts and smiles).

Aphasia

Aphasia is a disturbance of language that affects all modalities and is the result of cerebral damage to the dominant hemisphere. The salient features of the aphasic language deficit include reduction of available vocabulary, imparied verbal retention span, and impaired perception and production of messages (Schuell, Jenkins and Jimenez-Pabon, 1964). While classification systems have been devised to describe characteristic features of aphasic syndromes, many aphasiologists believe that all aphasic language disturbances will demonstrate under thorough clinical testing impairment in encoding (formulating) and decoding (understanding) of language when compared with premorbid language ability.

The nature of the language disturbance has been the focus of the search for a conclusive definition of aphasia. While many researchers maintain that aphasia is solely a linguistic impairment that may be complicated by other effects of brain damage (Schuell et al., 1964), others feel that aphasia would be better described as a disburbance in the utilization of symbols, not only the conventional units of language, but any event that represents another event, be it action, object, or abstraction. For example, Head (1926) viewed aphasia as a disturbance of symbolic formulation and expression. The aphasic person according to Head will demonstrate impairment in any process that requires the use of symbols.

> I have combined under the general heading "symbolic formulation and expression," the disorders of language produced by a unilateral lesion of the brain, because in the majority of instances the gravest disturbance is shown in the use of such symbols as words and figures. But any form of mental behavior is liable to suffer which demands perfect reproduction and use of any symbol between its initiation and fulfillment.(Head, 1963, pp. 209-210)

In discussiong all forms of human communication, Pittenger and Smith stated

> Communication is a specialization of symbolic behavior. This symbolic behavior is learned and shared by the persons within any culture. People learn the recurring sets and patterns of behavior used in communication, and these patterns come to have consistent and predictable meaning to all participants in the same culture.(1957, p. 61)

Coverbal behavior, like other systems of human communication, requires the use of symbols, signals and signs. As yet, it has not been demonstrated clearly whether the aphasic disturbance is purely a linguistic impairment (as proposed by Schuell et al., 1964 and Wepman, 1969) or whether concurrent impairment in the use of other shared, symbolic (albeit nonlinguistic) communicative behavior, i.e., coverbal behavior, also exists.

Gestural Research in Aphasia

Current aphasia literature emphasizes the investigation of the "gestural" mode of communication as a possible alternative to speech. A gesture is "a movement, or group of movements collectively, of the body, or parts of the body, to express or emphasize ideas, emotions, etc." (Webster's New World Dictionary, 3rd Ed., 1972). Although researchers in aphasis previously have addressed themselves to the topic of gestural ability (e.g., Jackson, 1879; Alajouanine and Lhermitte, 1963; Osgood and Miron, 1963; Critchley, 1970), until recently little empirical research has been done to describe systematically the extent of disturbances of gesture in aphasis. Researchers such as Goodglass and Kaplan (1963), Pickett (1974), Duffy, Duffy, and Pearson (1975) and Gainotti and Lemmo (1976) greatly contributed to our understanding of the aphasic person's ability to produce and/or comprehend various types of linguistic gestures. Others (e.g., Chen, 1971; Schlanger, Geffner and DiCarrado, 1974; Skelly, Schnisky, Smith and Fust, 1974; Schlanger, 1976) demonstrated some of the potentials and limitations of this alternate mode of communication for various types and severities of aphasis. These studies are important to the investigation of aphasis and coverbal behavior only insofar as they, too, emphasize the importance of the visual (kinesic) channel of communication; however, they are not representative of coverbal behaviorial research due to the linguistic nature of the gestures investigated.

Linguistic Gestures: Emblems and Pantomimes

The linguistic gestures thus far reported in aphasia research can be described as either emblems or pantomines. Emblems are nonverbal acts which have a direct translation, usually consisting of a word or phrase (Ekman and Friesen, 1969 and 1972). This class of gestures is identical to "conventional gestures," defined by Goodglass and Kaplan (1963) as commonly used, nonverbal communicative movements which are generally embedded in a situation where speech is also possible. In addition, emblems (and conventional gestures) are conscious, known by all members of a specific language community and can reinforce, contradict, or serve as a substitute for speech. Examples of this class of gestural behavior are the thumb and index finger opposed and closed for "O.K.," nodding and shaking the head for "yes" and "no," and placing the index finger on rounded lips for "be quiet."

A second class of gestures studied in aphasia is pantomime, which is behavior that ordinarily takes the place of speech when for some reason oral communication is not desired or possible. Pantomimes also differ from emblems in that the behavior observed is not conventional and symbolic (i.e., linguistic, *per se*), that is, meaning is not assigned to arbitrary symbols; rather, the behavior is composed of movements that are intended as direct isomorphic (iconic) representations of things, qualities or simple actions (e.g., describing certain properties of an object, or demonstrating some action imposed upon an object). Examples of this class of gestures include the subject's observable response to the command "Show me how you would eat corn on the cob" or " . . . how you would stir sugar in your coffee." Many Amerind signs (Skelly, Schinsky, Donaldson, and Smith, 1973) can be considered pantomimes as can responses elicited by stimuli in subtests II and III of the Porch Index of Communicative Ability (Porch, 1967).

Therefore, emblems and pantomimes are two classes of linguistic gestural behavior; the salient features of which are linguistic relevance, propositionality, and a conscious (volitional) level of functioning. The information communicated to the receiver ("listener") is predominantly factual. Like speech, these behaviors transmit specific denotative (and subsequent connotative) meaning via normal language processes, albeit differences in modality (visual instead of auditory).

The potential of emblems and pantomimes as alternative modes of communication for many aphasic individuals readily justifies emphasis on the assessment of linguistic gestural ability. Research in aphasia on emblems and pantomimes, however, has dominated the investigation of gestural behavior nearly to the exclusion of those nonverbal behaviors which accompany speech and are essentially paralinguistic, (i.e., coverbal behavior.

Aphasia and Communication

In a recent paper, Holland called attention to the fact that language and communication are not necessarily synonymous.

> Few of us communicate adequately or totally by speech or language alone. Further complicating this picture is the fact that the propositional semantic or syntactic content of our messages does not necessarily map the intent of our messages. Our utterances, in effect, do not always mean what our sentences mean. (1975, p. 1)

Holland also noted the importance of communicative competence to our understanding of communication and aphasia.

> . . . knowing about a language tells us very little about how an individual comes to use it appropriately. Communicative competence refers to a person's appropriate use of his language. It refers to his supralinguistic understanding of the way his language works in social interaction within his culture. Communicative competence thus indicates knowledge of the rules of social discourse in a given language community; it includes things like when to speak and when to be silent, with whom to be informal and with whom to be formal, and so on. (1975, p. 5)

Others (e.g., Chester and Egolf, 1974) also have reminded us that similar to normal speaking people, aphasic individuals need not communicate by words alone. People communicate through a variety of channels and the systematic investigation of these channels is necessary to the understanding of the communicative process (Sapir, 1927; Pittenger, and Smith, 1957; Buck, Savin, Miller, and Caul, 1972). Birdwhistell (1970) described the patterned, systematic body motion (i.e., coverbal behavior) of members of a community as a function of the social system to which they belong. This view is supported by Condon and Ogston (1966 and 1967) and Kendon (1970) who studied slow-motion films of social interaction occurring in a variety of settings (e.g., interviews, psychotherapy, mother-child playing). In addition to observing these shared patterns of behavior as they occur between interlocutors, these studies also demonstrated that posture and body movement are shared by interlocutors in rhythmic synchrony with the syllables, words and occasionally, phrases of both their own speech and the speech of each other. "Interactional synchrony" appears to be a continuous stream of coverbal feedback representing the relationship between interlocutors. In a review of Condon and Ogston's work, Brosin (1970, p. 143) stated that speech is almost always accompanied by "these parenthetical nonverbal commentaries" and that the patient who has a significantly different nonverbal communicative structure exists in "communicational isolation" from the rest of his community. Although the adverse effects of aphasia on linguistic communication is well documented and is the primary source of much investigation, the extent to which the aphasic communicator is impaired coverbally as yet has not been studied.

Aphasia and Coverbal Behavior

Although the coverbal behavior of aphasic subjects during spontaneous speech has not been the focus of research, various aspects of coverbal behavior have been studied in the aphasic population and are pertinent to this study. The influence of verbal behavior and concurrent coverbal behavior upon aphasic individuals during speech treatment sessions has been investigated. Stoicheff (1960) demonstrated the facilitating and inhibitory effects of "encouraging" and "discouraging" motivating instructions for 42 aphasic subjects on naming and reading tasks and on performance self-rating scales. The "encouraging" and "discouraging" instructions were each accompanied by the appropriate coverbal (e.g., facial, vocal) cues. Performance of the aphasic subjects improved following "encouraging" instructions; performance following "discouraging" instructions was not adversely affected. Stoicheff postulated that the performance of the aphasic patients was influenced by different levels of anxiety generated by the different instructions.

In an attempt to study hemispheric asymmetries in the perception of emotion from vocal cues alone, Heilman, Scholes, and Watson (1975) required subjects to discriminate the portrayed emotional mood (happy, sad, angry, indifferent) of a tape recorded speaker while controlling for content. They found that 6 fluent aphasic patients (left temporoparietal lesions) scored significantly more accurately ($\overline{x}$ = 10.17) than 6 control subjects with left unilateral neglect (right temporoparietal lesions) ($\overline{x}$ = 4.17). While it is assumed that normal, non-brain-damaged listeners would achieve a perfect score of 16, no normal listeners were incorporated in this study.

Dealing specifically with visual behavior, Wiig, Strauss, and Garwood (1973) investigated the accuracy of perception of emotion via visual cues for 15 aphasic subjects and their normal controls. Subjects were shown a silent videotape of an actress portraying 6 different emotions nonverbally (anger, embarrassment, fear, frustration, joy, and love). Judgments were indicated by requiring subjects to point to caricatures representing the expressed emotions. Aphasic subjects were significantly less accurate than the control group in the judgment of emotion. In addition, percentage of error for the aphasic group was positively correlated with severity of auditory comprehension impairment. The authors interpret the results as indicating that aphasic individuals demonstrate impairment of perception of facial aspects of emotion and that this impairment is positively correlated with impairment of auditory comprehension.

Chester and Egolf (1974) clinically noted the different ways listeners help or abuse aphasic individuals nonverbally. In observing 113 instances of nonverbal communication spontaneously utilized by persons in the aphasic patients' environment, only 22 (19.5%) were judged to have a positive effect (i.e., accepting the aphasic individual as a person and an adult) while 91 (80.5%) instances were judged negatively (i.e., unwarranted rejection of the aphasic person). Egolf and Chester suggested that while the nonverbal channels of communication are still being utilized by the aphasic individual and the others in his environment, the nonaphasic person apparently assumes too often that all channels of communication are as impaired as the aphasic person's verbal channel. The authors (Egolf and Chester, 1973; Chester and Egolf, 1974; Egolf, 1976) repeatedly have promoted systematic education for both the aphasic patient and those within his environment in the communicative potentials of nonverbal communication. Chester and Egolf (1974, pp. 231-232) cited 5 major reasons for incorporating the principles and techniques of nonverbal communication into aphasia therapy.

1. Nonverbal communication is basic to normal, daily interpersonal communication.

2. If the aphasic patient does not regain premorbid or even functional levels of communication, then aphasia therapy must deal with communication rather than speech or language.

3. Since nonverbal communication is probably phylogenetically and ontogenetically more primitive, these channels are probably intact in the aphasic patient to the point that the severe aphasic patient probably processes nonverbal messages better than verbal messages.

4. Since nonverbal communication is the primary mode for effective communication, it assumes greater significance in interpersonal interactions and the communication of emotion.

5. Finally, the acknowledgment and utilization of nonverbal communication may facilitate and complement retention of verbal skills, by allowing the aphasic patient to interact, thus making him more receptive to verbal training.

While little is known about the ability of aphasic individuals to comprehend coverbal behavior, less is known about their ability to produce these silent messages. In articles on the synchrony of human communicative behavior, Condon and Ogston (1966 and 1967) reported taking a high-speed film of 1 aphasic patient conversing with his speech clinician. A frame-by-frame analysis revealed a marked dysynchrony (in the form of a delay) of 1/48 of a second (the limit of their equipment) between the aphasic patient's coverbal behavior and his speech. With the exception of this descriptive reference, no systematic investigation of coverbal behavior elicited by aphasic persons has been reported.

Statement of the Problem

The research discussed thus far suggests that coverbal behavior is an important component of human communication. Effective communication requires the successful interaction of a myriad of behaviors. It is only through the simultaneous transmission of all channels of communication that the intended message remains intact and undistorted. Gestural research in apahsia has shown that aphasic subjects demonstrate impairment in the production and comprehension of emblems and pantomimes. Other research indicates that aphasic subjects are impaired in the ability to perceive emotion from nonverbal channels. However, the ability of aphasic subjects to produce coverbal behavior has not been investigated to date, although the significance of these behaviors for human communication has been clearly demonstrated.

If, in fact, aphasic subjects demonstrate differences in the use of coverbal behavior, then the concept of aphasia as solely a linguistic communication impairment (i.e., specifically a language deficit) might well be reassessed. Although closely integrated with speech, coverbal behavior is not subject to the linguistic structure of verbal behavior that is characteristically impaired in aphasia. Impairment of coverbal behavior, then, could not be considered the direct result of linguistic impairment, but rather secondary to aphasia or brain damage or both.

In addition, differences between groups would necessitate the systematic treatment of an impaired coverbal system of communication. Treatment of aphasic patients would include not only direct language intervention, but deal with coverbal behaviors essential to conversation as well. For example, first through imitation and drill practice and later through conversational role playing, aphasic patients could receive treatment in the appropriate use of head nods and eye contact for regulation of turn-taking. Such strategies would help improve the speaking effectiveness of aphasic patients at most levels of language ability.

Finally, if differences between groups were indicated, then clinicians would be alerted to the possibility of misinterpreting the coverbal behavior elicited by the aphasic patient. For example, the excessive use of head nods by an aphasic patient may be interpreted by the clinician as an indication of comprehension or willingness to cooperate. The patient, however, may not comprehend the instructions and is unable to cooperate on the task but does not wish to intentionally deceive the clinician. In this example, inappropriate use of coverbal behavior adversely affects the nature of the relationship between clinician and patient.

On the other hand, if differences between groups of subjects are not observed and coverbal behavior appears unimpaired in the aphasic population, then a different set of conclusions is indicated. First, the view of aphasia as solely a linguistic deficit is supported if aphasic subjects do not indicate impairment in the ability to elicit nonlinguistic though arbitrary communicative symbols. The apparent incongruity between this finding and Head's (1926 and 1963) definition of aphasia as a disturbance of symbolic formulation and expression may well represent differences in the levels of complexity between these two interdependent systems of communication. According to Schuell et al. (1964), more complex processes become possible as the effects of the lesion diminish and the cortex restablishes. Luria (1965) reported that when a lesion in the cortex causes impairment to a basic process, all processes above that basic process in the hierarchy will also be disturbed. If coverbal behavior is unimpaired in the aphasic population, it would appear that coverbal behavior is a less complex system of communication than linguistic behavior, possibly in respect to the number of basic units and meanings, and to the organization of the units within each system of communication. The lesion which causes aphasia impairs the utilization of symbols at the linguistic level, leaving lower symbolic processes (specifically, coverbal behavior) intact.

A second conclusion might explain subjective feelings frequently expressed by many people in contact with aphasic individuals that a particular aphasic person comprehends more than objective tests may indicate. If the integrity of coverbal behavior is unaffected in aphasia, i.e., if coverbal behavior is not correlated with auditory comprehension, then an explanation for this subjective observation is provided. The friend, relation or speech clinician may be attending to the aphasic person's normal output of coverbal behavior and not to any level of functional language output. This leaves the observer with a definite "feeling" that he and the aphasic person are communicating although the aphasic person may actually understand little or no speech. Consequentially, if the aphasic person's level of coverbal "performance" may be used as an indication of his coverbal "competence," then the clinician is well advised to monitor carefully his own coverbal behavior so that he may not unwittingly communicate feelings he may wish to conceal from the patient.

Finally, if no differences are demonstrated between groups of subjects, then the clinician may use the intact system of coverbal behavior to support an aphasic patient's disabled ability to communicate verbally. Although his output of coverbal behavior may be within normal limits, an aphasic patient may be instructed in the use of coverbal behavior to enhance his ability to communicate. Efficiency of communication may be improved by the systematic utilization and inhabitation of particular coverbal behaviors. For example, by increasing the aphasic patient's awareness of coverbal behavior, he may be able to monitor his own behaviors more effectively so that he will not inadvertently indicate comprehension of speech by nodding his head in response to the head nods of the speaker, but rather substitute eye contact and head shaking. Also, some facial expressions may substitute for speech in the communication of particular feelings or emotions in response to specific questions or situations.

The relation between verbal (speech) ability and coverbal behavior is also of interest. For example, a decrease in the ability to utilize the speech channel may be accompanied by a concurrent decrease in the use of coverbal behavior. Although the output of coverbal behavior may be within normal limits (as compared with the control group of subjects), a significant correlation may exist between speech ability and coverbal behavior. Aphasic subjects more severely impaired verbally may also use less coverbal behavior, further impeding communication, or these subjects may use more coverbal behavior spontaneously as an attempt to compensate for their speech impairment. The relation between coverbal behavior and other communicative abilities is also sought. The ability to use both linguistic gestures (specifically, pantomimes) and coverbal behavior was compared. The lack of a strong relationship between these two classes of gestural behavior would be an indication of their relative independence and the heterogeneity of the gestural mode of communication. Conversely, a strong positive relationship would indicate commonality between the two classes and suggests the impairment of some basic process shared by both linguistic and nonlinguistic gestures. Finally, the ability to decode linguistic material visually (reading) and encode linguistic material graphically (writing) were compared with coverbal behavior. Reading and writing were selected for comparison because reading and coverbal behavior are both decoded visually and writing and coverbal behavior are encoded gesturally.

Statement of the Purpose

Therefore, the purpose of this study was to investigate whether or not speakers suffering from aphasia demonstrate a concurrent impairment in coverbal behavior and, if so, to verify the quality of the impairment. A second objective was to assess the relationship between severity of linguistic impairment and amount of coverbal behavior elicited. The following questions were posed:

1. Are there significant differences in the rate, duration, and average length of coverbal behavior in aphasic subjects when compared with a group of normal speaking, nonbrain damaged adults?

2. Do rate, duration, and average length of coverbal behavior vary predictably with the severity of particular aphasic language impairments?

The null hypotheses are

1. No significant differences exist in the rate, duration, and average length of coverbal behavior between aphasic subjects and normal speaking, nonbrain damaged adults.

2. The rate, duration, and average length of coverbal behavior do not vary predictably with the severity of particular aphasic language impairments.

CHAPTER II

PROCEDURE

Subjects

Ten aphasic adults, evaluated in the Audiology and Speech Pathology Service at the Gainesville Veterans Administration Hospital, served as subjects in the experimental group. Patients classified as aphasic subjects met the following criteria:

1. left hemispheric cerebrovascular accident (thrombosis or embolism)
2. at least 3 months post onset
3. score below the 85th percentile on the PICA
4. PICA profile and judgment of a certified speech pathologist consistent with diagnosis of aphasis
5. premorbid right handedness
6. no premorbid history of mental disorder
7. outpatient status (living at home)

The control group consisted of 10 normal speaking, non-brain-damaged adults. Each were matched with an aphasic subject according to the following parameters:

1. sex
2. age
3. race

4. outpatient status (living at home)

5. educational level

6. vocational level

Any subject whose personal history or behavior during testing suggested a possible hearing problem had to pass an audiologic screening test for both ears at frequencies and intensities of 20 dB at 0.5k, 1k, and 2k Hz. re: ISO. Descriptive data for the 2 groups are presented in Table 2.

Measurements

Aphasic and control subjects were measured as to the rate, duration, and average length of particular coverbal behaviors elicited during the speaking sample. Aphasic subjects also were measured as to the severity of their language impairments.

Coverbal Behavior

Choice of coverbal behavior. Researchers studying the area of nonverbal communication have investigated a large range of behaviors from Birdwhistell's (1970) "stress kineme" to Scheflen's (1965) "postural cue." Microscopic behaviors (such as the "stress kineme") were not investigated in this study. These behaviors require special equipment and long hours of assessment and, therefore, may be of limited value to a clinician during a "live" clinical session. The coverbal behaviors selected for investigation in this study were included for the following reasons: 1) research indicates that they reflect important social

Table 2

Description of Age and Education for Aphasic and Control Groups of Subjects and Months Post Onset for Aphasic Group of Subjects

GROUPS OF	AGE IN YEARS			EDUCATION IN YEARS			MONTHS POST ONSET		
SUBJECTS	$\overline{X}$	RANGE	SD	$\overline{X}$	RANGE	SD	$\overline{X}$	RANGE	SD
Aphasic	57.6	42-73	9.0	8.5	3-12	3.7	21.2	3-90	25.9
Control	55.8	40-75	9.6	10.9	8-16	2.6	----	----	----

psychological dynamics of conversational interaction, 2) they are easily observed in a socially acceptable manner (i.e., looking at the subject's face and head) by participants in (or observers of) an ongoing conversation, and 3) they are easily and reliably recorded by a judge (or judges) viewing a videotape recording of the interaction.

The specific behaviors investigated are

1. eye contact (Argyle and Dean, 1965; Kendon, 1967; Russo, 1970)
2. eyebrow raise (Woodall, 1976)
3. smile (Van Hoof, 1972)
4. head nod (Argyle, 1972; Dittmann, 1972)
5. head shake
6. head tilt (Campbell, 1976)

These behaviors are each operationally defined in Appendix A.

<u>The turn</u>. The speaking <u>turn</u> is a fundamental element of conversation and is generally accepted as the simplest and most reliable method of segmenting the behavioral stream of conversational interaction (Schegloff, 1968; Duncan, 1972; Markel, 1975). In the present study, turns were elicited by asking each subject to tell what he "thinks" about a certain word. Twenty of the 500 most commonly used words in the English language (Thorndike and Lorge, 1963) were presented individually to each subject. These 20 words are actually 10 pairs of opposites, for example, <u>life</u> and <u>death</u>, <u>black</u> and <u>white</u>, <u>work</u> and <u>play</u>. The subject's turn began following his last utterance, i.e., when he was no longer

speaking. Therefore, for each subject, 20 separate turns were elicited. A copy of the list of stimulus words and the instructions to the subjects may be found in Appendix B.

Rate, duration, and average length of coverbal behavior. For each subject in both the experimental and control groups, the above mentioned coverbal behaviors each received measurements of rate, duration, and average length as these behaviors were observed while viewing the videotape recording of the speaking turn.

In this study, rate refers to the frequency in which a particular behavior was observed to occur across all 20 turns of a subject's speaking sample (rate = frequency/speaking time = mean number of behaviors per minute). Duration refers to the time during which a particular behavior was observed to occur across all 20 turns of a subject's speaking sample (duration = cumulative time/speaking time = mean number of seconds per minute). Average length refers to the average duration of 1 occurrence of a particular behavior across all 20 turns of a subject's speaking sample (average length - cumulative time/frequency of occurrence = mean number of seconds per occurrence). A more detailed description of the procedures used for calculating these values may be found under "Treatment of the Raw Data."

Subjects were allowed to speak for as long as they wished; variation in the total length of time of turns among subjects was equalized when calculating the rate (frequency over *speaking time*) and duration (cumulative time over *speaking time*). The values thus obtained for each subject represent the relative levels of rate and duration of each coverbal behavior as it was observed occurring across all 20 turns. Equalization among subjects was not necessary when calculating the average length, since this value is simply an indication of the average duration of 1 occurrence of a behavior.

Severity of aphasic impairment. Nine severity measurements of linguistic impairment were made from each aphasic subject's performance on the *Porch Index of Communicative Ability* (*PICA*), a 40-item version of the *Token Test* (LaPointe, Andersen, Cutler, Horsfall, McCall, and Ready, 1971) and the *Functional Auditory Comprehension Task* (LaPointe, Horner, Lieberman, and Riski, 1974). In addition to the more conventional mean scores provided by the *PICA* (overall performance and performance by gestural, verbal, and graphic modalities), the mean scores of several functionally related subtests (II and III, V and VII, VI and X) were also calculated.

The mean of functionally related subtests indicates the ability of the subject to perform on a particular communicative task. Subtests II and III (object manipulation/pantomime) were employed independently of the other gestural output subtests in this study because these 2 subtests assessed the subject's ability to demonstrate the function of objects through pantomime and/or object minipulation, i.e., the ability to perform the gestural behaviors necessary for the expressed representation of simple actions with objects. It is this ability that was often tapped by previous investigations primarily concerned with assessing the linguistic potential of the gestural output modality.

Subtests V and VII (reading) assessed the subject's ability to read and comprehend written commands.

Subtests VI and X (auditory comprehension) assessed the subject's ability to comprehend auditorily the name and function of objects.

The Token Test and the Functional Auditory Comprehension Task (FACT) measured auditory comprehension more extensively than PICA subtests VI and X. The Token Test is a sensitive instrument designed to measure a patient's ability to comprehend nonredundant verbal commands of increasing linguistic complexity, while at the same time requiring minimal intellectual functioning (DeRenzi and Vignolo, 1962). The FACT approximates functional communication in its use of objects more relevant to the patient's environment. On this test, the patient is given 1-, 2-, and 3-part commands, while the number of actions and objects required are systematically varied. Copies of Token Test and FACT response forms may be found in Appendix C.

In summary, the language ability of each aphasic subject was assessed according to performance on the following standarized tests:

PICA

1. Overall performance (OA)
2. Verbal output modality (VRB)
3. Gestural output modality (GST)
4. Graphic output modality (GPH)
5. Object manipulation/pantomime (OMP)
6. Reading comprehension (RD)
7. Auditory comprehension (AC)

Token Test

8. Auditory comprehension (TT)

FACT

9. Auditory comprehension (FACT)

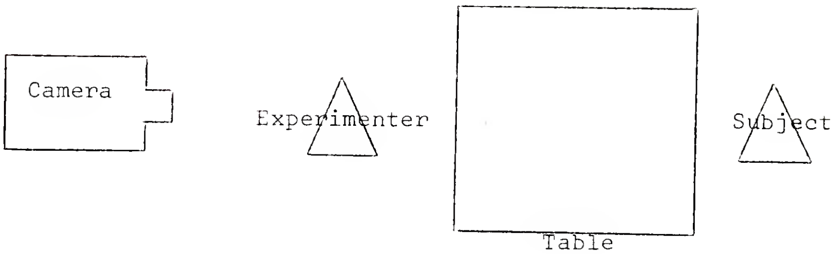
Performance on these 9 measures of linguistic ability were correlated with amount of coverbal behavior elicited for all 10 aphasic subjects to determine whether or not a relationship exists between linguistic ability and output of coverbal behavior. Performance of the aphasic subjects on all 9 measurements of linguistic ability may be found in the Results Section (Table 7).

Preparation of Videotape Recording

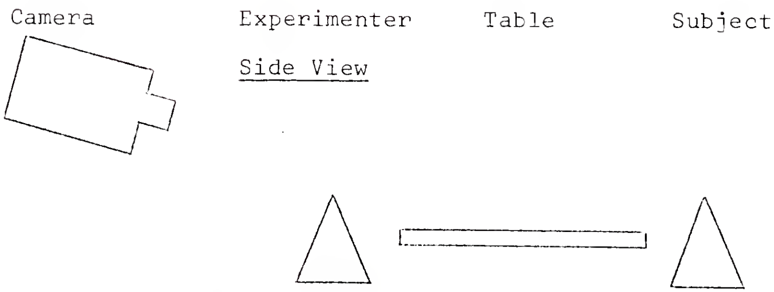
The coverbal behaviors observed and measured are transitory and required specialized equipment and procedures to accurately preserve their selection and utilization. In view of the lack of an existing and easily applicable system of notation, it was necessary and desirable to videotape the subjects' observable behaviors and from this recording make all judgments and measurements. The importance of videotape and sound film to the study of coverbal behavior has been reported previously (Brosin, 1970; Berger, 1970). Specific advantages of a videotape strategy for this study include: 1) the preservation of the behaviors under investigation, i.e., the experimenter was not forced to make an immediate judgment in an attempt to place (or code) each behavior under one of a limited number of predetermined categories, nor did he have to monitor simultaneously several different behaviors. Since measurement was not limited to the live experimental session, repeated monitoring of the selected behaviors as well as measurement of other behaviors that occurred was possible. 2) Intra- and inter-tester reliability of the experimenter's judgments was able to be determined.

Apparatus and Setting

A 10' x 12' room usually used for speech therapy with a 3' x 3' table and 2 chairs were used. Figure 1 illustrates this arrangement. The videotape camera was situated directly behind the experimenter (in view of the subject) and focused on the subject's head and shoulders. Two camera lights were directed toward the subject at 45 degree angles on either side of him. The signal from the camera was fed into a videotape recorder and the resultant recording was stored for subsequent analysis. This arrangement permitted a recorded image of the subject's face and shoulders which



Top View



Side View

Figure 1. Apparatus and experimental settings.

represented the view of the subject seen by the experimenter during the original interaction, and thus preserved the subject's facial and had movements for later monitoring.

Recording Procedure

Each subject was recorded individually. The subject sat at a table across from the experimenter so that the camera could focus directly on the subject's face and shoulders, giving the recorded picture described above. Prior to the recording, the experimenter engaged each subject in spontaneous conversation in an attempt to establish a relaxed atmosphere. After 2 or 3 minutes, the experimenter asked the subject if he was ready to proceed and then read the instructions to the subject. When the subject indicated he understood the task, he was asked to look at the experimenter's eyes. At that moment, the recorder was started. This procedure was incorporated so that a specific reference point could be obtained that would precisely represent direct eye contact. Finally, each subject was verbally identified by subject number preceding the administration of the stimulus words.

Monitoring of Videotape Recording

The experimenter and 1 trained assistant monitored the videotape recordings individually and together. Each recording was viewed at least 8 times: once for each of the 6 coverbal behaviors studied, 1 time for measurement of speaking time for the 20 turns, and at least 1 time for reliability.

The experimenter sat in front of the videotape television to watch the recorded speaking samples. After determining the coverbal behavior to be monitored, the experimenter began the tape and pressed a switch each time the behavior was observed, maintaining switch pressure until that behavior no longer occurred. The switch activated a counter-timer each time it was pressed and thus, simultaneously, a cumulative record was kept of the frequency and time of occurrence of each behavior. After each turn, the experimenter wrote the frequency and cumulative time for that behavior in a log (Appendix D). Thus, for each subject, a record of the frequency and cumulative time of each coverbal behavior (and the total speaking time) for each turn and for all 20 turns was acquired. The mean value for all 20 turns was then computed by subject and these scores were converted to rates, durations, and average lengths.

Treatment of the Raw Data

When the speaking time of each turn, and the frequency and cumulative time of coverbal behavior for each turn were measured, the rate, duration, and average length values to be analyzed statistically were calculated. Rate, duration, and average length were obtained by subject for each coverbal behavior across all 20 turns.

Rate was calculated by dividing the speaking time (in seconds) into 60 seconds and then multiplying the quotient by the frequency, e.g.,

$$\text{Rate} = \frac{\text{frequency of occurrence}}{\text{speaking time (seconds)}} = \text{behaviors per minute}$$

$$\text{Rate} = \frac{\text{4 eye contacts}}{\text{25.9 seconds}} \times \frac{1}{\text{60 seconds}}$$

Rate = 9.267 eye contacts per minute

Duration was calculated by dividing the speaking time (in seconds) into 60 seconds and then multiplying the quotient by the cumulative time, e.g.,

$$\text{Duration} = \frac{\text{cumulative time}}{\text{speaking time}} = \text{seconds per minute}$$

$$\text{Duration} = \frac{\text{21.1 seconds}}{\text{25.9 seconds}} \times \frac{1}{\text{60 seconds}}$$

Duration = 48.88 seconds per minute

Average length was calculated by dividing the cumulative time by the frequency, e.g.,

$$\text{Average length} = \frac{\text{cumulative time}}{\text{frequency of occurrence}}$$

$$\text{Average length} = \frac{\text{21.1 seconds}}{\text{4 eye contacts}}$$

Average length - 5.275 seconds per eye contact

Measurement of Reliability

In order to obtain a measurement of interjudge reliability, 1 subject from the control group (subject no. 19) was monitored by 2 viewers and their measurements were compared. Statistics for the computation of the reliability measurement (r_1) may be found in Appendix E. Table 3 containes the measurement of reliability for each of the 13 variables observed. A value close to 1.00 indicates a small measurement error variance and high reliability.

All reliability measurements are sufficiently high. Ten of the 13 measurements are 1.00. One (total speaking time) is 0.98. The 2 variables with the lowest reliability measurement are number of head tilts (0.92) and number of head nods (0.82). Although the reliability level of these 2 variables is still satisfactory, a possible explanation for the relatively low measurements is provided. Apparently, judges disagreed occasionally on the juncture of head tilts and nods, i.e., where one behavior ended and another began. The judges, however, agreed exactly on the cumulative time of occurrence, or when these behaviors actually were elicited by the subjects. Reliability measurements for the cumulative time of <u>all</u> behaviors are 1.00. Unlike some coverbal behaviors (such as eye contact, eyebrow raise, smiling, and head shaking), the boundaries of individual head nods and head tilts always were not perceived clearly; however, the fact that these behaviors were occurring (cumulative time) was perceived accurately by the 2 judges.

Table 3

Measurement of Reliability
for Each of the 13 Variables

VARIABLES	r_1
Time	0.98
Eye Contact Number	1.00
Eye Contact Time	1.00
Eyebrow Raise Number	1.00
Eyebrow Raise Time	1.00
Smile Number	1.00
Smile Time	1.00
Head Nod Number	0.84
Head Nod Time	1.00
Head Shake Number	1.00
Head Shake Time	1.00
Head Tilt Number	0.92
Head Tilt Time	1.00

Subject no. 19 spoke for a relatively long time, eliciting most coverbal behaviors readily and, therefore, was an ideal subject for interjudge reliability measurements. Because the coverbal behaviors measured were the same for both aphasic and control subjects and because the reliability measurements were high, it was felt that performing a second set of reliability measurements using an aphasic subject would not be required.

CHAPTER III

RESULTS

Before reporting the statistical treatment and results of the computed measurements of rate, duration, and average length, it is of interest to present first the untreated measurements that were originally recorded by the experimenter while monitoring the videotape recordings of the 2 groups of subjects. For each subject, 20 speaking turns were monitored from which the total speaking time of the 20 turns, and the frequency of occurrence and cumulative time of occurrence of 6 coverbal behaviors were obtained. The mean value for each of the above 13 variables (6 coverbal behaviors x 2 measurements + total speaking time) for each subject was calculated. Finally, the mean value for each variable was calculated for each group of subjects (Table 4).

Many similarities exist between the mean values for the 2 groups. Separate t-tests reveal no significant differences ($p < .05$) between groups for total speaking time and frequency and cumulative time of occurrence of coverbal behavior. The total cumulative time for head shaking, however, was more than 3 times greater for the aphasic group than for the control group. Although this difference

Table 4

Means of Frequency of Occurrence and
Cumulative Time for 6 Coverbal Behaviors

Total Speaking Time:
Aphasic Group = 308.22 seconds
Control Group = 298.67 seconds

COVERBAL	FREQUENCY		TIME (SECONDS)	
BEHAVIORS	APHASIC	CONTROL	APHASIC	CONTROL
Eye Contact	57.10	58.50	167.08	153.74
Eyebrow Raise	14.80	17.20	19.00	26.93
Smile	5.70	10.30	10.65	11.28
Head Nod	42.00	40.20	30.70	23.45
Head Shake	20.40	16.50	24.56	7.41
Head Tilt	10.70	12.70	72.00	138.10
TOTAL	150.70	155.40	323.99	360.91

between groups is not statistically significant, the strong trend toward head shaking for the aphasic group indicates direction for further investigation.

Rank ordering of the coverbal behaviors for both frequency and cumulative time of occurrence from the largest to smallest value also reveals little difference between groups of subjects (Table 5). Eye contact occurred most frequently and for the greatest amount of time for both aphasic and control groups. Head nods were the second most frequently occurring behavior for both groups, while head tilts and smiles occurred least often. Fewer similarities were observed between groups when ranking behaviors by the amount of cumulative time of occurrence. While eye contact occurred for the greatest amount of time and head tilting occurred the next most often, differences in the ranking of the remaining 4 coverbal behaviors existed between groups. Finally, little difference was noted between groups in the total speaking time. The 20 speaking turns of both the aphasic and control subjects each averaged approximately 300 seconds (5 minutes).

<u>Question No. 1</u>

> Are there significant differences in the rate, duration, and average length of coverbal behavior in aphasic subjects when compared with a group of normal speaking, nonbrain-damaged adults?

Rate, duration, and average length of occurrence of coverbal behavior were computed to provide relative

Table 5

Rank Order (from Greatest to Least)
of Mean Values for 2 Measurements of 6 Coverbal Behaviors
for Aphasic and Control of Subjects

RANK NUMBER	FREQUENCY		TIME (SECONDS)	
	APHASIC	CONTROL	APHASIC	CONTROL
+				
1	Eye Contact	Eye Contact	Eye Contact	Eye Contact
2	Head Nod	Head Nod	Head Tilt	Head Tilt
3	Head Shake	Eyebrow Raise	Head Nod	Eyebrow Raise
4	Eyebrow Raise	Head Shake	Head Shake	Head Nod
5	Head Tilt	Head Tilt	Eyebrow Raise	Smile
6	Smile	Smile	Smile	Head Shake

measurements of the occurrence of coverbal behavior independent of the actual amount of time spent talking (total speaking time). The mean, range, and standard deviation of the variables for each group of subjects are provided in Table 6. Hotelling's T^2 statistics (Morrison, 1968, pp. 125-126) were computed to test for differences between the aphasic and control group means for the rate, duration, and average length of all 6 coverbal behaviors investigated. That is, instead of observations on only 1 coverbal behavior at a time, simultaneous observations on all 6 coverbal behaviors were obtained. Hotelling's T^2 statistics test the equality of the 2 vectors (mean values) for each of the measurements (rate, duration, and average length). The statistics and p-values relevant to testing the hypothesis of no difference between groups are presented in Table 7. As indicated by the p-values, no significant differences exists between groups of subjects in their mean rate, duration, and average length of coverbal behavior.

Because 2 coverbal behaviors were not elicited by several subjects, the average length variable was divided into 2 sets. Set 1 (eye contact, eyebrow raise, head nod, head shake) are those behaviors that were elicited by all 20 subjects. Set 2 (smile, head tilt) are those behaviors that were not elicited by all 20 subjects and, therefore, are undefined for some subjects because of a zero divisor (average length = cumulative time/frequency of occurrence). Observations for which either element of Set 2 were

Table 6

Mean, Range, and Standard Deviation of Rate, Duration, and Average Length of Coverbal Behaviors for Aphasic and Control Gourps of Subjects
(* p = 0.045, ** p = 0.011)

CVB	RATE (bhvr/min.)		DURATION (sec.)		AVERAGE LENGTH (sec.)	
Measurements	Aphasic	Control	Aphasic	Control	Aphasic	Control
Eye Contact						
Mean	11.6	14.4	32.8	30.2	2.9	2.8
Range	6.0-18.2	2.4-27.2	9.4-46.0	4.0-53.6	1.1-4.5	0.8-9.0
SD	3.7	8.2	11.3	15.9	1.2	2.7
Eyebrow Raise						
Mean	2.6	3.7	3.4	6.8	1.2	1.0
Range	0.4-7.6	0.2-12.2	0.0-8.7	0.0-37.6	0.0-3.7	0.2-3.1
SD	2.2	3.8	3.3	11.9	1.2	1.0
Smile						
Mean	1.2	1.9	2.1	2.2	2.1	1.2
Range	0.0-3.1	0.0-5.6	0.0-5.7	0.0-7.9	0.7-3.6	0.3-4.3
SD	1.1	1.8	1.8	2.4	1.1	1.2

Table 6 - continued

CVB Measurements	RATE (bhvr/min.) Aphasic	Control	DURATION (sec.) Aphasic	Control	AVERAGE LENGTH (sec.) Aphasic	Control
Head Nod						
Mean	8.2	8.0	6.6	3.7	0.8*	1.4
Range	0.9-15.4	3.3-15.0	0.5-17.0	0.7-14.5	0.2-1.6	0.2-1.1
SD	4.4	4.3	5.2	4.6	0.5	0.3
Head Shake						
Mean	3.8	3.1	4.8*	1.4	1.2**	0.4
Range	0.2-7.1	0.4-6.0	0.1-16.2	0.1-3.1	0.3-3.7	0.1-0.9
SD	2.4	2.0	4.9	1.2	0.9	0.2
Head Tilt						
Mean	2.0	2.6	13.1	19.9	5.3	11.8
Range	0.2-4.1	0.0-5.8	0.3-43.5	0.0-70.0	2.0-10.5	2.2-69.9
SD	1.3	1.7	12.7	24.3	2.4	22.0

Table 7

Statistics and P-Values Testing the Hypotheses of No Difference Between Aphasic and Control Groups of Subjects (N_c = Number of Control Subjects, N_a = Number of Aphasic Subjects)

VARIABLE	N_c	N_a	p	HOTELLING'S T	$F = \frac{N_c + N_a - p - 1}{(N_c + N_a - 2)\ p} T^2$	p-VALUE
Rate	10	10	6	2.66	0.32	0.91
Duration	10	10	6	8.22	0.99	0.47
AvLn Set 1	10	10	4	9.26	1.93	0.16
AvLn Set 2	8	9	2	2.49	1.16	0.34

undefined were deleted from the analysis. To test further for differences between groups of subjects, individual t-tests were applied to each of the 18 variables (6 coverbal behaviors by 3 measurements). All but 3 of the individual t-tests yielded p-values greater than 0.05. The variables demonstrating the greatest difference ($p < 0.05$) and their respective p-values are displayed in Table 8. Duration and average length of head shaking and average length of head nodding were significantly greater for the aphasic group than for the control group. The 2 groups of subjects were not found to differ significantly with respect to the remaining 15 variables. The use of individual t-statistics will yield, on the average, a p-value of 0.05 or less by chance for 1 out of every 20 tests. The individual t-tests results, however, may be used to single out variables for further investigation.

Question No. 2

> Do rate, duration, and average length of coverbal behavior vary predictably with the severity of particular aphasic language impairments?

Test scores on 9 measurements of language performance were obtained for the 10 aphasic subjects (Table 9). The Pearson Correlation Coefficient was computed to determine the relation between measurements of coverbal behavior and performance on the various language tests. The variables and language tests for which the Pearson Correlation Coefficient rejects the hypothesis of zero correlation (p 0.05)

Table 8

Results of Individual T-Tests for Variables Yielding P-Values Less Than 0.05 When Testing for Differences between Aphasic and Control Groups of Subjects (N = 10 Subjects Per Group)

VARIABLE	P-VALUE
Head Shake - - Duration	0.945
Head Shake - - Average Length	0.011
Head Nod - - Average Length	0.045

Table 9

Performance of Aphasic Subjects
on 9 Measurements of Linguistic Ability

Subject Number	OA	GST	VRB	GPH	OMP	RD	AC	TT	FACT
1	11.27	12.26	14.23	7.97	11.55	7.50	15.00	25	45
2	11.18	14.34	6.75	10.05	13.35	13.70	14.90	7	41
3	10.31	12.87	9.68	7.93	11.20	11.40	14.70	11	37
4	11.87	13.49	13.48	8.65	11.20	12.75	15.00	29	49
5	13.04	13.84	14.50	11.00	10.75	14.60	15.00	35	41
6	10.80	13.76	8.63	8.30	11.75	13.30	15.00	31	51
7	10.64	12.75	10.50	7.92	10.35	11.40	14.25	2	43
8	11.42	13.26	11.30	9.03	10.25	13.60	14.20	8	34
9	11.05	12.33	11.63	8.97	10.25	11.25	12.90	6	23
10	12.50	13.78	13.00	10.45	11.25	13.95	14.90	22	50
MEAN	11.41	13.27	11.37	9.03	11.19	12.35	14.59	17.6	41.4

are summarized in Table 10. The Pearson Correlation Coefficients for all variables and language measurements are presented in Appendix F.

Most significant correlations between language ability and amount of coverbal behavior were negative. Rate of head shaking was negatively correlated with overall performance (OA) on the PICA, while the duration and average length of head shaking were correlated negatively with performance on the auditory comprehension subtests (AC) on the PICA. These last 2 correlations were among the most significant found (-0.75 and -0.72, respectively). The duration of head tilting was also negatively correlated with auditory comprehension performance on the PICA. No significant correlations, however, were obtained between measurements of coverbal behavior and 2 other tests of auditory comprehension (Token Test and Functional Auditory Comprehension Task) and, therefore, findings pertaining to the relation between coverbal behavior and auditory comprehension should be viewed with caution until further assessment is possible.

Another of the most significant correlations (-0.72) was the inverse relation between duration of eye contact and verbal performance (VRB) on the verbal output subtests on the PICA. Rate of smiling also was correlated negatively (-0.66) with language performance on verbal subtests (VRB). The average length of eyebrow raising, however, was correlated positively (+0.67) with verbal performance (VRB) and

Table 10

Correlation Coefficients for Coverbal Variables and Performance on Language Tests for 10 Aphasic Subjects ($p < 0.05$)

COVERBAL VARIABLES	LANGUAGE TESTS	CORRELATION COEFFICIENTS	LEVELS OF SIGNIFICANCE
Head Shakes - Rate	OA	- 0.67	0.04
Head Shake - Duration	AC	- 0.75	0.01
Head Shake - Average Length	AC	- 0.72	0.02
Head Tilt - Duration	AC	- 0.68	0.03
Eye Contact - Duration	VRB	- 0.72	0.02
Eyebrow Raise - Average Length	VRB	+ 0.67	0.03
Smile - Rate	VRB	- 0.66	0.04
Smile - Duration	OMP	+ 0.66	0.04
Smile - Average Length	RD	- 0.67	0.04

the only statistically significant variable positively correlated with verbal performance. The relation between duration of smiling and performance on the 2 object manipulation/pantomime subtests (OMP) on the PICA revealed the only other statistically significant positive correlation (+0.66). Finally, the average length of a smile was correlated negatively (-0.67) with performance on the reading subtests (RD) on the PICA.

In summary, 9 variables (measurements of coverbal behavior) each were found to be correlated significantly with performance on 1 of 5 measurements of language ability. While each variable was correlated significantly with only 1 language measurement, verbal ability (VRB) and auditory comprehension (AC) each were correlated significantly with 3 different coverbal variables. Three other language measurements (OA, OMP, and RD) each were correlated significantly with 1 different coverbal variable. Nine statistically significant correlations (7 positive, 2 negative) out of a possible 162 relationships between coverbal variables and language measurements were obtained.

One-third of the coverbal variables were found to be significantly correlated with language performance. Of these 9 variables, 4 involved movements of the head and 5 involved movements of the face. Movements of the head were correlated exclusively with overall performance (OA) and performance on the auditory comprehension subtests (AC) on the PICA. Movements of the face correlated exclusively with performance on the verbal output subtests (VRB), object manipulation/pantomime subtests (OMP) and reading comprehension.

While reviewing the data, 1 measurement of language ability was compared in retrospect with output of coverbal behavior. Although fluency of speech may be represented by the presence or absence of delayed scores (13's and 11's) on the PICA, no objective measurement specifically designed to assess fluency was administered to the aphasic subjects. Since it was no longer possible to administer an objective fluency measurement to these subjects, aphasic subjects were classified as either fluent or nonfluent with respect to the absence or presence of silent pauses and/or silent phonemic grouping behavior. Other initiation problems (e.g., repetition of initial phoneme or syllable or retrials using different combinations of phonemes on each attempt) might also be present but did not constitute independently nonfluent behavior as defined in this study.

Judgments of fluency were made from information obtained from the patients' records kept by the Speech Pathology Service as well as from the occurrency of nonfluent behavior (as defined above) as observed by a certified speech pathologist who had reviewed all the videotapes and had met with the subjects individually. Following this procedure, 6 apahsic subjects were judged to have fluent speech and 4 were judged nonfluent. Means for the 2 groups of aphasic subjects are presented in Table 11. Individual t-tests

Table 11

Mean Coverbal Variables for Fluent (N=6) and Nonfluent (N=4) Aphasic Subjects ($p < .05$)

	FLUENT (N=6)		NONFLUENT (N=4)
		RATE	
Eye Contact	10.2		13.6
Eyebrow Raise	3.2		1.7
Smile	0.9		1.4
Head Nod	8.9		6.8
Head Shake	3.6		3.9
Head Tilt	2.2		1.7
		DURATION	
Eye Contact	30.7		35.8
Eyebrow Raise	4.9		0.8
Smile	1.7		2.6
Head Nod	6.4		6.8
Head Shake	3.9		5.9
Head Tilt	12.7		13.5
		AVERAGE LENGTH	
Eye Contact	3.0		2.8
Eyebrow Raise	1.7		0.3
Smile	2.3		1.8
Head Nod	0.6		0.9
Head Shake	1.1		1.4
Head Tilt	5.7		4.8

revealed only one significiant difference ($p < 0.05$) between fluent and nonfluent aphasic subjects. Fluent aphasic subjects elicited significantly greater duration of eyebrow raising than nonfluent aphasic subjects. No other significant differences were demonstrated between aphasic subjects based solely upon the dimension of fluency.

CHAPTER IV

DISCUSSION

Question No. 1

Several conclusions pertaining to the relationship between coverbal behavior and aphasia are possible from this investigation. First and most significantly, within the context of this study, aphasic subjects as a group did not differ significantly from a group of non-brain-damaged, normal speaking subjects in their output of coverbal behavior. While aphasic subjects as a group spent a significantly greater proportion of their speaking turns shaking their heads than the control group, no other differences in output of coverbal behavior were observed. The differences in average length of head shaking is not interpreted as the direct result of the aphasic language distrubance, i.e., as an "impairment" of coverbal behavior; rather, average length of head shaking during speech served to maintain the speaking turn and thus provide increased processing and/or formulating time for the aphasic speaker. This modification in duration of coverbal behavior illustrates the functionality of the coverbal system of communication for language-impaired speakers.

Aphasic subjects frequently were observed shaking their heads while experiencing difficulty speaking, whether the actual difficulty in verbal formulation was specifically phonemic (as in the selection and sequencing of phonemes) or the retrieval of words. Although aphasic subjects shook their heads as often as normal speakers (usually during concurrent negative verbal responses), the period of time for head shaking during speech was longer for the aphasic group. As well as serving to reinforce the verbal channel, prolonged head shaking also appeared to be in response to concurrent verbal output difficulty. By shaking his head for a longer period of time, the aphasic speaker experiencing difficulty in speech was able to communicate to the listener his frustration and desire to continue his speaking turn. It seems, then, that although coverbal behavior is integrated closely with speech (verbal) behavior, nevertheless, impairment of the more complex system of language does not precipitate a disorder of coverbal behavior. The findings indicate, therefore, that for the range of severity of language impairment represented in this study, aphasic speakers do not suffer a concurrent impairment in the use of coverbal behavior. Coverbally, aphasic and control subjects represent a single communicative population.

It appears, then, that the view of aphasia as a linguistic (language) deficit is supported as opposed to a more general view of aphasia as an impairment in the use of all signs (i.e., shared patterns of arbitrary symbols with physical, social or abstract referents). This difference between the linguistic and nonlinguistic systems of communicative, arbitrary symbols illustrates the differences in levels of complexity. Unimpaired in the aphasic patient, coverbal behavior is a less complex system of communication than linguistic behavior, possibly in respect to the number of basic units and meanings, and to the organization of the units within each system of communication. The lesion which causes aphasia affects the use of symbols at the more complex linguistic (language) level, but allows communicative processes in the symbolic hierarchy that are less complex to remain functionally intact.

Question No. 2

The second finding concerns the relation between coverbal behavior and language ability as assessed by performance on several standarized tests. While still within the range of normal responses established by the control group, several coverbal variables were demonstrated to have statistically significant relationships with language performance.

Rate of Head Shakes and Overall Performance

The rate of head shaking behavior was correlated negatively with aphasic subjects' overall performance on the 18 subtests of the PICA. Aphasic subjects who were "better communicators" (higher linguistic ability) were less likely to elicit head shakes while speaking than those subjects who were "poor communicators." That is to say, rate of head shaking increased as ability to communicate decreased. It appears that many aphasic subjects increased the occurrence of head shakes to compensate for verbal language problems and that the increased incidence of head shakes allowed the aphasic speaker to continue his speaking turn during these pauses and interruptions of speech.

Duration of Head Shakes, Average Length of Head Shakes and Duration of Head Tilts, and Auditory Comprehension

Three coverbal behaviors involving movement of the head were correlated negatively with performance on the auditory comprehension subtests (VI and X) on the PICA. Subjects who performed less accurately on these tests elicited head shakes that on the average were slower and longer. Consequentially, the relative amount of time spent shaking the head was increased. During speech, these increases in time may have been attempts to signal the continuation of the speaking turn.

A third coverbal variable that was correlated with auditory comprehension was duration of head tilts. Although no significant relation was demonstrated between rate of head tilts and auditory comprehension, when head tilts did occur, speakers with more severe auditory comprehension impairment tended to tilt their heads for a greater amount of time. This finding is consistent with that of Campbell (1976) who reported a highly positive relation between tilts of the head and a submissive and attentive role. The subject with poor auditory comprehension may find that becoming more observant of the listener's behavior during conversation will facilitate his own understanding of the conversation. Like head shakes, however, increases in the duration of head tilts may represent simply the subject's attempt to continue his speaking turn even though he may be experiencing formulation difficulty. More importantly, it should be noted that no significant relation was found between any coverbal variable and performance on 2 other tests of auditory comprehension (Token Test and FACT); therefore, the findings pertaining to auditory comprehension should be viewed with caution until further investigation is done.

Duration of Eye Contacts, Average Length of Eyebrow Raises and Rate of Smiles, and Verbal Performance

Three coverbal variables (each one a facial display) were correlated with verbal ability as measured by the 4 verbal subtests on the PICA at or below the 0.04 level of significant. Aphasic subjects who performed less accurately on these subtests elicited more smiles, longer periods of eye contact and shorter eyebrow raises during speech than did those subjects who performed more accurately on the verbal subtests. Eyebrow raises can be used as a suprasegmental cue and, like prosody, are unimpaired in many aphasic speakers. Use of eyebrow raises, then would increase along with increased verbal performance. In addition, it is interesting to note that duration of eyebrow raises was the only coverbal variable demonstrated to be statistically different ($p < .0.05$) for the fluent ($\bar{x}$=4.9 seconds) and nonfluent ($\bar{x}$=0.8 seconds) aphasic subjects. Duration of eye contacts and rate of smiles were elicited more by subjects who performed less accurately on the verbal subtests. The subjects with greater verbal ability displayed less affliative behavior than those subjects who were more verbally impaired. The more fluent subject could continue his speaking turn simply by continuing to speak, while the aphasic subject experiencing less fluency with speech required other, coverbal cues (e.g., maintaining eye contact) to hold the floor while he was attempting to formulate and speak.

Duration of Smiles and Object Manipulation/Pantomime Ability

The purpose of comparing output of coverbal behavior and performance on the 2 object manipulation/pantomime subtests on the PICA (II and III) was to assess the relation (if any) between coverbal behavior and linguistic gestures such as those previously studied in other investigations of gestural ability in aphasic subjects. The results indicate a lack of commonality between the 2 classes of gestures as only 1 coverbal variable (duration of smiles) correlated significantly with performance on these subtests. The statistically significant value obtained for this correlation may be manifested from the relatively large number of individual t-tests (N=162) rather than reflect any likely relationship between coverbal behavior and linguistic ability.

Average Length of Smiles and Reading Comprehension

Output of coverbal behavior was compared with ability to decode linguistic material visually (reading) as both reading and coverbal behavior are decoded visually. Not unlike the previous comparison, little similarity was observed between amount of coverbal behavior and reading ability. Only 1 coverbal variable (average length of smiles) was correlated significantly with performance on PICA subtests V and VII. The single correlation between coverbal behavior and reading does not support the possibility of a strong relation between nonlinguistic (coverbal) and linguistic (reading) behavior that is decoded visually.

Because of the possibility that statistical significance for any particular correlation may be manifested by the relatively large number of t-tests (N=162) computed, and also due to the relatively small number of aphasic subjects used in the second analysis, it would facilitate the accurate interpretation of the findings if further analysis and interpretation were done on the 3 most significant correlations ($p < 0.02$).

Duration of Head Shakes and Auditory Comprehension

The most statistically significant correlation (-0.75, $p=0.01$) was obtained by comparing the duration of head shakes with performance on the auditory comprehension subtests of the PICA. Subjects who elicited a greater duration of head shakes performed more poorly on these measurements of auditory comprehension. As can be seen from Figure 2, performance on the auditory comprehension subtests was skewed positively (only 1 subject scored below 14.2 while 6 subjects scored 14.9 or 15.0). While subjects performing least accurately on these subtests did elicit a significantly greater duration of head shakes than the other 9 subjects, it may be misleading to assume that the relation between head shakes and auditory comprehension was observed for 10 subjects demonstrating a variety of auditory comprehension scores. In addition, the lack of significant correlation between head shaking and performance on 2 other tests of auditory comprehension (Token Test and FACT) is an indication that no general trends probably exist for this limited range of severity. Perhaps further investigation with a more equal distribution of subject performance would reveal the exact nature of the relation between duration of head shakes and auditory comprehension.

Average Length of Head Shakes and Auditory Comprehension

Findings similar to the previous correlation were found (-0.72, p=0.02) when comparing the average length of head shakes and auditory comprehension (Figure 3) because 1) the range of performance on the auditory comprehension subtests is skewed identically, and 2) when the rate of a behavior essentially is consistent for all subjects, duration, and average length measurements will yield similar

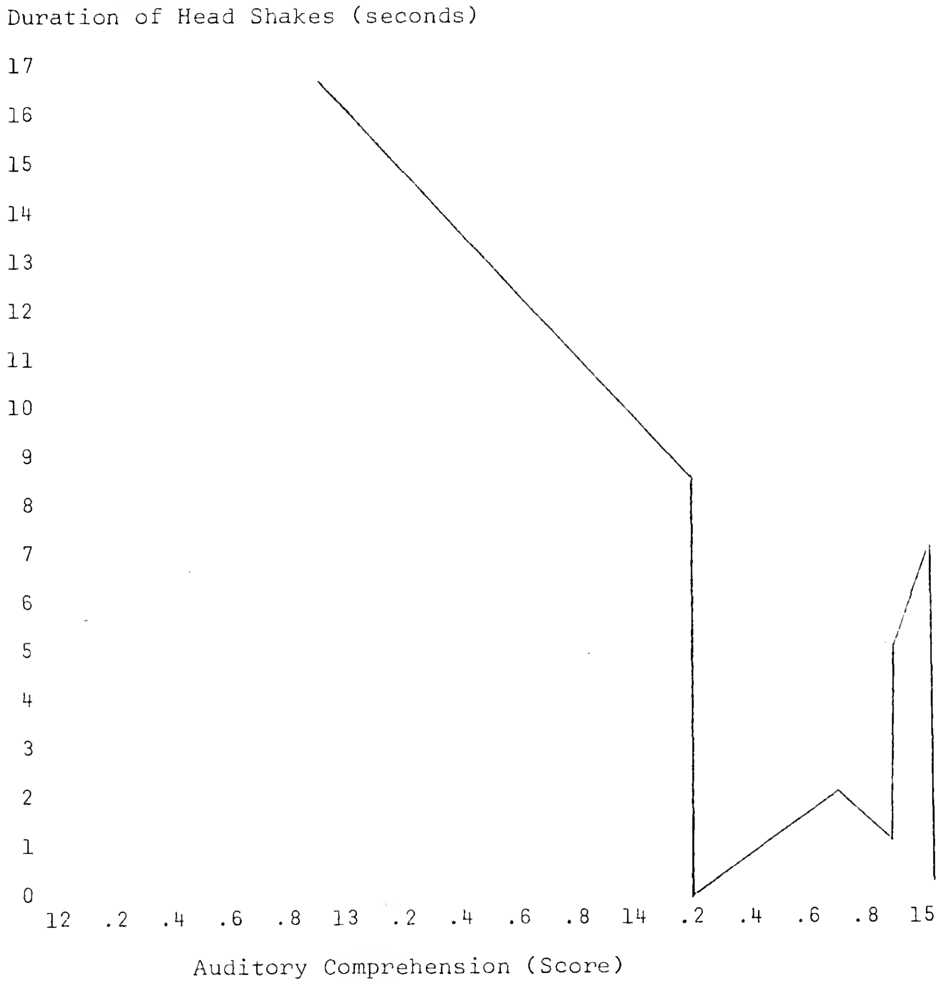


Figure 2. Aphasic subjects: head shaking duration by auditory comprehension ($r = 0.75$, $p = 0.01$)

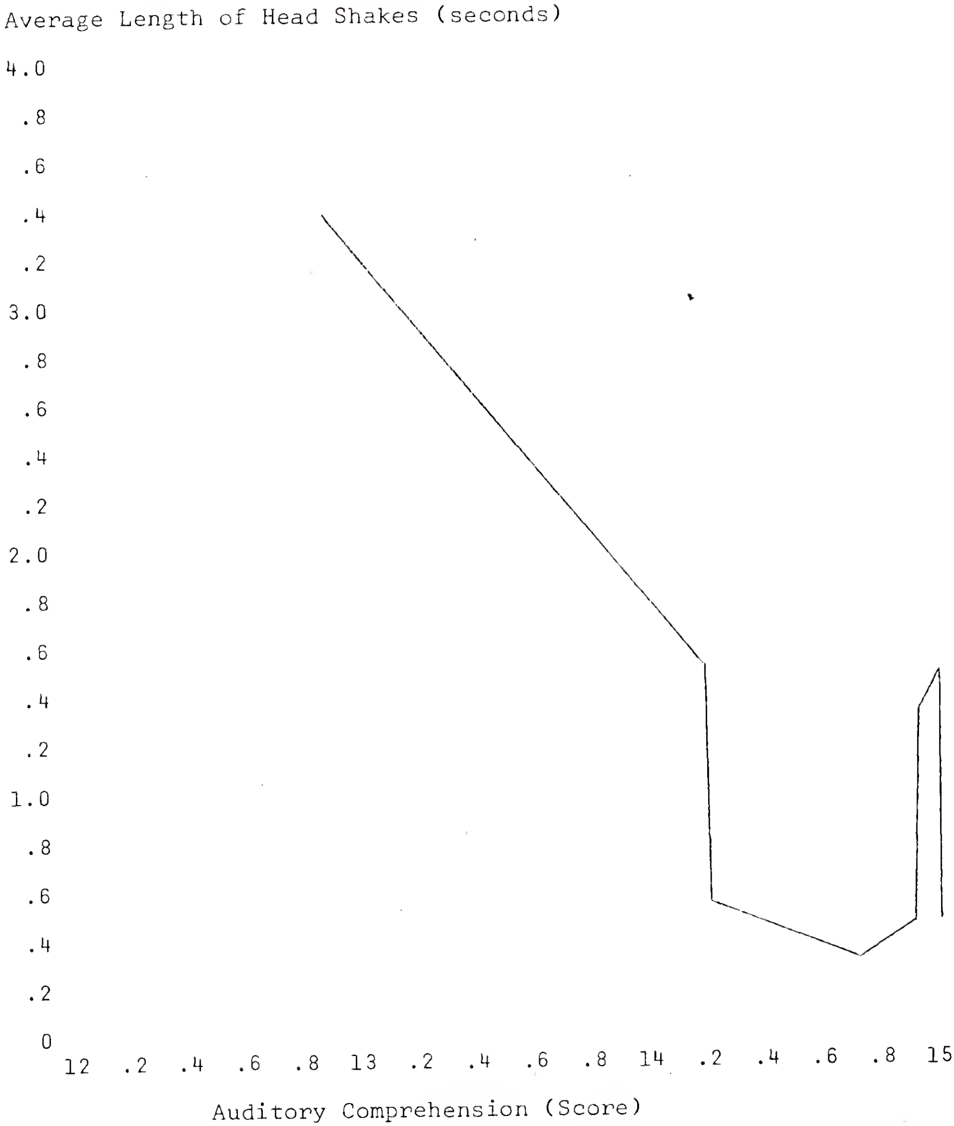


Figure 3. Aphasic subjects: head shaking average length by auditory comprehension.

values (see pp. 41 -42). While the difference in seconds between the subject performing least accurately on the auditoriy comprehension subtests is significantly greater than the average length of the remaining 9 subjects, further study of more subjects with a greater range of performance appears necessary before any trends may be described.

Duration of Eye Contact and Verbal Performance

A third statistically significant correlation (-0.72, p=0.02) was found when comparing duration of eye contacts and verbal performance (Figure 4). Mean performance on the 4 verbal subtests on the PICA is represented by well distributed scores ranging from 6.75 to 14.5. As verbal performance improved, duration of eye contacts decreased over a range of 37 seconds. Apparently, as the verbal ability of aphasic subjects increased, duration of eye contacts was not as critical a cue for continuing the speaking turn. Although further study of the relationship between eye contact and verbal ability is indicated, the results indicating an inverse relation between duration of eye contact during speech and verbal ability strongly suggest that eye contact is used spontaneously by aphasic speakers to supplement speech for the continuation of the speaking turn.

Summary

The results of this study indicate that coverbal behavior is unimpaired in mild and moderately impaired aphasic speakers. Because of the nature of the speaking task,

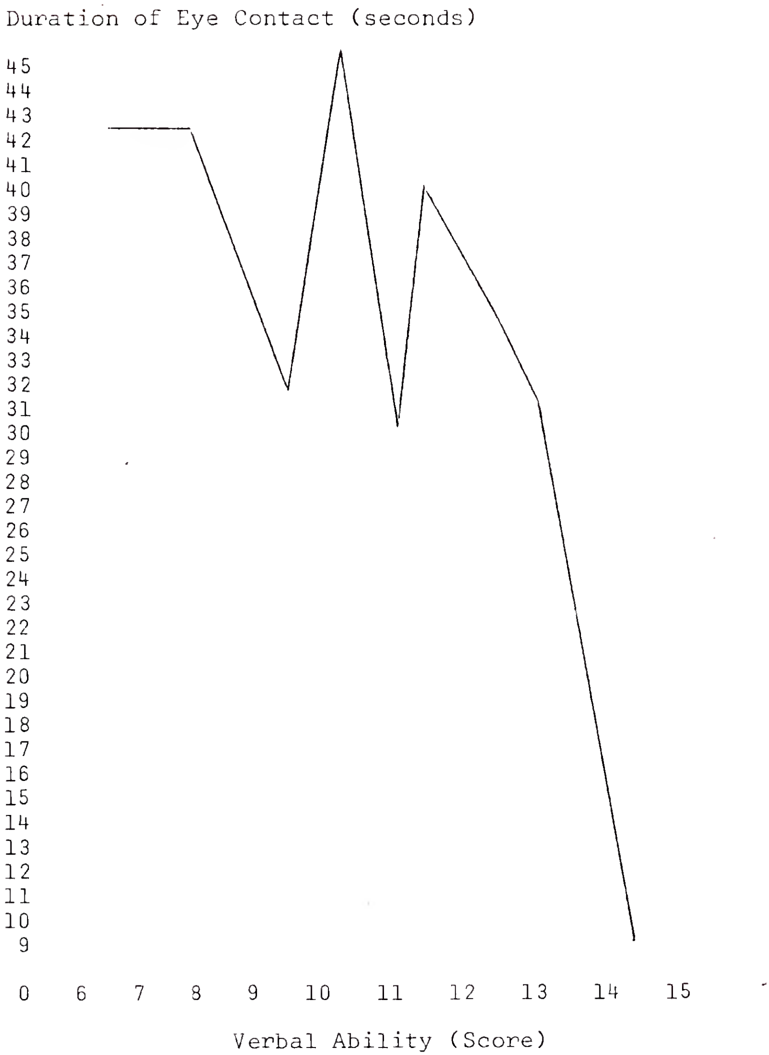


Figure 4. Aphasic subjects: eye contact duration by verbal ability.

severely impaired aphasic subjects with minimal auditory comprehension ability were not employed; however, the fact that no concurrent impairment in the use of coverbal behavior was found in any aphasic subject suggests that coverbal behavior may be intact for all but the most severely impaired aphasic patient--one who has sustained massive cortical damage. Coverbal behavior, therefore, is seen as a form of communication similar to language behavior in the utilization of shared patterns of arbitrary symbols (signs). While obvious differences lie in the 2 primary modalities used ("gestural" and "verbal"), the 2 forms of communication (with relatively few signs and limited meanings), language behavior represents an open system that uses many more signs and can produce an unlimited variety of meanings. This difference in level of complexity reflects the fact that cortical damage to the dominant hemisphere frequently produces language impairment while specific loss of coverbal behavior (independent of arousal and attention disturbances) secondary to cortical damage as not been reported as yet. Therefore, it appears that coverbal behavior is lower on the hierarchy of symbolic processes than language behavior.

The fact that coverbal behavior is an intact means for communication for most aphasic speakers indicates why, as Holland (1975) suggests, aphasic people are better communicators than language users. Although without normal limits, some relationships between coverbal behavior and language do exist. Most significantly, aphasic subjects tended to shake their heads for a longer period of time during speech than normal speakers. In addition to duration of head shakes, average length of head shakes and duration of eye contacts during speech appear to be significantly related with various language abilities (e.g., verbal output ability) and possibly represent the compensatory behavior of these language impaired speakers. While it appears that many aphasic speakers modify their coverbal behavior without any specific training, compensatory behaviors such as these should be explained to the aphasic patient and their systematic use encouraged.

Implications fur Further Research

As the study progressed it became apparent that several factors could be improved. Most important, it might have been more beneficial to include a greater number of subjects, especially when considering the comparisons between the coverbal behavior and language abilities of aphasic subjects. The highly skewed scores on the auditory comprehension tests on the PICA made interpretation of the results more difficult to generalize to the aphasic population.

Several variations of this study are suggested. First, a similar study incorporating aphasic subjects with severe auditory comprehension impairment would yield relevant findings concerning the relation between coverbal behavior and aphasia. Reported increases in measurements of coverbal behavior would substantiate subjective clinical observations such as Alajounine and Lhermitte who report that "patients with motor aphasia or Broca's aphasia commonly have poor gestures, whereas patients with a temporal aphasia offer a very rich gesticulation" (1963, p. 168).

Also, many significant findings in this study dealt with time (as duration or as average length) rather than frequency (rate). Studies such as those reported by Condon and Ogston (1966 and 1967) on the delay of an aphasic subject's coverbal behavior might also yield significant information concerning the relation between language impairment in aphasia and coverbal behavior.

Finally, a hierarchy of various types of gestures might be constructed from the information provided by the several investigations that dealt with aphasia and gestural ability and comprehension. This heirarchy could serve as direction for the development of task continuum for the teaching of gestures to aphasic patients. Patients could begin with gestures they can produce spontaneously (e.g., coverbal behaviors) and progress up through "automatic gestures" (or "animal gestures") to more complex, linguistic gestures (such as Amerind signs).

APPENDIX A

OPERATIONAL DEFINITIONS OF COVERBAL BEHAVIOR

EYE CONTACT: Eyes are directed towards the experimenter's eyes, as indicated when viewing the videotape recording by the position of the eyes relevant to the eye contact reference point obtained at the beginning of each recording.

EYEBROW RAISE: Eyebrows are raised from their normal resting position, causing lines to form on the forehead.

HEAD NOD: The head is moved bidirectionally on a vertical (sagittal) plane.

HEAD SHAKE: The head is moved bidirectionally on a horizontal (transverse) plane.

HEAD TILT: The head is moved bidirectionally on a diagonal plane.

SMILE: The lateral aspects of the lips are raised bilaterally from their normal resting position.

APPENDIX B

INSTRUCTIONS TO THE SUBJECTS AND LIST OF STIMULUS WORDS

COVERBAL BEHAVIOR WORD RESPONSE LIST

N. MARKEL
AUGUST 1975

<u>INSTRUCTIONS TO THE SUBJECTS:</u>

In this project we are studying what people think about commonly used words. I have a list here of 20 of the most commonly used words in the English language. The words are:

> black--white; boy--girl; crying--laughing; death--life; enemy--friend; father--mother; hate--love; king--queen; man--woman; play--work.

I will ask you to tell me what you think about these words, one at a time. For example, I will say "What do you think about <u>children</u>?" and then you will tell me what you think about <u>children</u>. Do you have any questions? (Wait for questions.) O.K. Let's try one for practice: "What do you think about <u>banks</u>?" (Let S respond.) Good. One further instruction: after I say the word I'm not supposed to answer any questions so just tell me what you think about the word. (START VIDEOTAPE.) O.K. We're ready to begin with subject number __. Before we begin I want you to look right here between my eyes (point). Good. Let's start.

"What do you think about __________?"

APPENDIX B - continued

1. BLACK
2. BOY
3. CRYING
4. DEATH
5. ENEMY
6. FATHER
7. FRIEND
8. GIRL
9. HATE
10. KING
11. LAUGHING
12. LIFE
13. LOVE
14. MAN
15. MOTHER
16. PLAY
17. QUEEN
18. WHITE
19. WOMAN
20. WORK

APPENDIX C

COPIES OF TOKEN TEST AND FACT RESPONSE FORMS

TOKEN TEST
SPEECH PATHOLOGY
V.A. HOSPITAL
GAINESVILLE, FLA.

Score Time	
________	Part I
________	Part II
________	Part III
________	Part IV
________	Part V

I. Large tokens (order: rectangles, circles)

P F

1. red circle ________
2. yellow rectangle ________
3. blue circle ________
4. white circle ________
5. green rectangle ________

II. All tokens (order: large circle, small circle, large, then small rectangle)

P F

1. small white circle ________
2. large blue rectangle ________
3. small yellow rectangle ________
4. large red circle ________
5. small green circle ________

III. Large tokens (order: rectangles, circles)

P F

1. white rectangle & blue rectangle ________
2. red circle & green rectangle ________
3. yellow circle & white circle ________
4. red rectangle & blue rectangle ________
5. small green circle ________

APPENDIX C - continued

IV. All tokens (order: large circles, small circles,
P F large rectangles, small rectangles)

1. large red rectangle & large green circle________
2. large blue circle & small yellow circle_________
3. small blue circle & large yellow rectangle______
4. large white circle & small green rectangle______
5. large white rectangle & small green circle______

V. Large tokens (order: rectangles - green next to
P F yellow; then the circle)

1. Put the red circle on the green rectangle _______
2. Put the white rectangle behind the yellow circle ______________________________________
3. Touch the blue circle with the red rectangle____
4. Touch - with the blue circle - the red rectangle _____________________________________
5. Touch the blue circle and the red rectangle_____
6. Pick up the blue circle or the red rectangle____
7. Put the green rectangle away from the yellow rectangle _____________________________________
8. Put the white circle in front of the blue rectangle _____________________________________
9. If there is a black circle, pick up the red rectangle _____________________________________
10. Pick up the rectangles except the yellow one____
11. When I touch the green circle, you take the white rectangle ______________________________
12. Put the green rectangle beside the red circle___
13. Put the red circle between the yellow rectangle and the green rectangle _____________
14. Except for the green one, touch the circles_____
15. Pick up the red circle - no! - the white rectangle _____________________________________
16. Instead of the white rectangle, take the yellow circle _________________________________
17. Together with the yellow circle, take the blue circle ___________________________________
18. After picking up the green rectangle, touch the white circle ______________________________
19. Put the blue circle under the white rectangle___
20. Before touching the yellow circle, pick up the red tectangle ______________________________

VA Form 10-54 (573)
June, 1973

APPENDIX C - continued

FUNCTIONAL AUDITORY COMPREHENSION TASK

Action and Object Manipulation

Audiology and Speech Pathology Service
Veterans Administration Hospital
Gainesville, Florida

Patient Name ____________________
Date ____________________
Examiner ____________________

Materials:

Movable objects:	coin, key, pencil, paper, cup, spoon
Objects in Room:	ceiling, floor, table (desk), door, chair, pajamas (shirt)
Actions:	point to, tap, shake, pick up, give me, turn over, lift, move, hand me, touch

Instructions:

This is a test of understanding spoken directions. It involves objects on the table (gesture) and objects in the room. Listen very carefully, as I cannot repeat any item. Are you ready?

I. ONE-PART COMMANDS

(a) One Action - One Object: Object changes

		P	F
1.	Point to the chair.		
2.	Point to the floor.		
3.	Point to the pencil.		
4.	Point to the paper.		
5.	Point to the ceiling.		
6.	Point to the money.		
7.	Point to the cup.		
8.	Point to the door.		
9.	Point to the spoon.		
10.	Point to the table.		

APPENDIX C - continued

(b) One Action - One Object: Action Changes

		P	F
11.	Tap the spoon.		
12.	Shake the spoon.		
13.	Point to the spoon.		
14.	Pick up the spoon.		
15.	Give me the spoon.		
16.	Turn over the spoon.		
17.	Lift the spoon.		
18.	Move the spoon.		
19.	Hand me the spoon.		
20.	Touch the spoon.		

II. TWO-PART COMMANDS

(a) One Action - Two Objects

		P	F
21.	Point to the ceiling and point to the floor.		
22.	Point to the key and point to the money.		
23.	Point to the paper and point to your pajamas.		
24.	Point to the door and point to the table.		
25.	Point to the chair and point to the pencil.		

(b) Two Actions - One Object

		P	F
26.	Point to the cup and tap the cup.		
27.	Turn over the cup then give me the cup.		
28.	Pick up the cup then shake the cup.		
29.	Shake the cup then give me the cup.		
30.	Turn over the cup then tap the cup.		

(c) Two Actions - Two Objects

		P	F
31.	Point to the floor and give me the paper.		
32.	Point to the chair and pick up the pencil.		
33.	Pick up the key and touch your pajamas.		
34.	Give me the money and point to the table.		
35.	Point to the ceiling and give me the key.		

APPENDIX C - continued

F.A.C.T.

III. THREE-PART COMMANDS

(a) One Action - Three Objects

		P	F
36.	Point to the table, point to your pajamas and point to the pencil.		
37.	Point to the key, point to the money, and point to the paper.		
38.	Point to the ceiling, point to the chair, and point to the door.		
39.	Point to the floor, point to the key, and point to the chair.		
40.	Point to the pencil, point to the paper, and point to the money.		

(b) Three Actions - One Object

		P	F
41.	Point to the cup, turn over the cup, then give me the cup.		
42.	Turn over the cup, pick up the cup, then shake the cup.		
43.	Tap the cup, shake the cup, then give me the cup.		
44.	Pick up the cup, tap the cup, then give me the cup.		
45.	Turn over the cup, point to the cup, then pick up the cup.		

(c) Two Actions - Three Objects

		P	F
46.	Point to the floor and point to the chair, and give me the key.		
47.	Point to the table and point to your pajamas, and pick up the money.		
48.	Pick up the paper and pick up the key, and point to the ceiling.		
49.	Give me the money and give me the pencil, and point to the table.		
50.	Point to your pajamas and point to the floor, and give me the key.		

APPENDIX C - continued

F.A.C.T.

(d) Three Actions - Three Objects

		P	F
51.	Point to the door, pick up the pencil, and touch the table.		
52.	Give me the money, point to the chair, and pick up the paper.		
53.	Point to the table, give me the money, and pick up the key.		
54.	Pick up the paper, point to the ceiling, and give me the pencil.		
55.	Give me the key, point to your pajamas, and pick up the paper.		

Score		Subtotals
Part I.	(a) ______	
	(b) ______	______
Part II.	(a) ______	
	(b) ______	
	(c) ______	______
Part III.	(a) ______	
	(b) ______	
	(c) ______	______
	TOTAL:	______

VAF 10-66 (573)
December, 1974

APPENDIX D

SUBJECT LOG FOR FREQUENCY AND CUMULATIVE TIME

	TIME	EC	EBR	SM	HN	HS	HT
BLACK							
BOY							
CRYING							
DEATH							
ENEMY							
FATHER							
FRIEND							
GIRL							
HATE							
KING							
LAUGHING							
LIFE							
LOVE							
MAN							
MOTHER							
PLAY							
QUEEN							
WHITE							
WOMAN							
WORK							
TOTAL							

Subject No. ______

APPENDIX E

STATISTICS FOR THE COMPUTATION OF THE RELIABILITY MEASUREMENT

In order to obtain a measure of inter-judge reliability, Subject 19 was monitored by 2 viewers and their measurements were compared. Let s_1^2 and s_{12} be the mean of squared deviations from the average for Observer 1 and the mean of the cross-products of deviations for Observers 1 and 2. One of the several possible measures of reliability for Observer 1 is computed as

$$r_1 = \mathrm{Min}\ (s_{12}/s_1^2, 1).$$

To illustrate the computation of r_1, we write the i^{th} observation ($i = 1,2\ldots,20$), by the first observer, on the variable TIME as $T1_i$ and the corresponding observation by the second observer as $T2_i$. Then

$$s_1^2 = 1/20 \sum_{i=1}^{20} (T1_i - \overline{T1})^2$$

and

$$s_{12} = 1/20 \sum_{i=1}^{20} (T1_i - \overline{T1})\ (T2_i - \overline{T2}),$$

where

$$\overline{T1} = 1/20 \sum_{i=1}^{20} T1_i$$

and

$$\overline{T2} = 1/20 \sum_{i=1}^{20} T2_i$$

We have $s_1^2 = 781.20$ and $s_{12} = 766.30$. Hence, $r_1 = 0.98$.

If the population parameter corresponding to r_1 is 1.00, then the measurement error variance for Observer 1 is zero.

APPENDIX E - continued

Hence a value of r_1 close to 1.00 indicates a small measurement error variance and high reliability. Table contains the measure of reliability, r_1, for each of the 13 variables observed. "Undefined" in this case refers to the fact that the statistics for these variables contains a zero divisor. Since the values of both judges are identical, r_1 is interpreted as 1.00.

APPENDIX E - continued

Table 12

Reliability Measures Including Intermediate Values for Each of the 13 Variables

VARIABLES	s_1^2	s_2^2	s_{12}	r_1
Time	39.06	39.98	,38.32	0.98
Eye Contact Number	0.69	0.69	0.69	1.00
Eye Contact Time	4.97	4.97	4.97	1.00
Eyebrow Raise Number	0.23	0.23	0.23	1.00
Eyebrow Raise Time	0.05	0.05	0.05	1.00
Smile Number	0.00	0.00	0.00	undefined
Smile Time	0.00	0.00	0.00	undefined
Head Nod Number	3.83	3.13	3.22	0.84
Head Nod Time	4.00	4.15	4.01	1.00
Head Shake Number	0.65	0.65	0.65	1.00
Head Shake Time	0.07	0.08	0.07	1.00
Head Tilt Number	1.19	1.03	1.09	0.92
Head Tilt Time	0.61	0.64	0.63	1.00

APPENDIX F

Table 13

Pearson's Correlation Coefficients for 18 Coverbal Variables
and 9 Language Test Scores for the Aphasic Group of Subjects (N = 10)

VARIABLES	GST	VRB	GPH	OA	OMP	AC	VSL	TT	FACT
ECRATE	0.33	- 0.02	0.02	- 0.07	- 0.02	- 0.01	0.46	- 0.32	- 0.10
EBRRATE	- 0.22	- 0.24	- 0.56*	- 0.48	- 0.17	- 0.05	- 0.21	0.11	0.22
SMRATE	0.48	- 0.66**	0.04	- 0.23	0.55*	0.18	0.27	0.03	0.09
HNRATE	0.28	- 0.42	- 0.10	- 0.24	0.07	0.07	0.35	0.06	0.35
HNRATE	- 0.09	- 0.55	- 0.53	- 0.67**	0.16	- 0.09	- 0.09	- 0.17	0.11
HTRATE	- 0.13	0.63*	0.37	0.57*	- 0.57	- 0.46	0.20	0.24	- 0.25
ECDURA	0.05	- 0.72**	- 0.34	- 0.61*	0.18	- 0.34	0.08	- 0.59*	- 0.01
EBRDURA	- 0.37	0.31	- 0.34	- 0.05	0.16	0.16	- 0.50	0.35	0.27
SMDURA	0.22	- 0.57*	- 0.10	- 0.33	0.66**	0.08	- 0.11	- 0.17	- 0.01
HNDURA	- 0.01	- 0.49	- 0.23	- 0.43	0.08	- 0.32	0.02	- 0.54	- 0.06
HSDURA	- 0.33	- 0.20	- 0.21	- 0.33	0.20	- 0.75**	0.13	- 0.41	- 0.48
HTDURA	- 0.35	0.41	0.14	0.24	- 0.46	- 0.68**	- 0.06	0.01	- 0.44

APPENDIX F - continued

Table 13 - continued

VARIABLES	GST	VRB	GPH	OA	OMP	AC	VSL	TT	FACT
ECAVLN	- 0.30	- 0.42	- 0.45	- 0.57*	0.08	- 0.36	- 0.35	- 0.33	0.02
EBRAVLN	- 0.21	0.67**	0.12	0.45	- 0.21	0.24	- 0.27	0.57*	0.12
SMAVLN	- 0.53	0.33	- 0.43	- 0.13	- 0.03	- 0.21	- 0.67**	- 0.14	0.03
HNAVLN	- 0.06	- 0.43	- 0.14	- 0.37	0.29	- 0.34	- 0.15	- 0.57*	- 0.22
HSAVLN	- 0.20	0.05	0.17	0.05	- 0.27	- 0.72**	0.04	- 0.26	- 0.59*
HTAVLN	- 0.46	0.43	- 0.06	0.13	- 0.36	- 0.57	- 0.31	0.06	- 0.25

* The hypothesis of zero correlation is rejected at the 0.10 level but not at the 0.05 level.

** The hypothesis of zero correlation is rejected at the 0.05 level.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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