Coverbal Behavior of Aphasic and Right Hemisphere Damaged Subjects in Conversation

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Title: Coverbal Behavior of Aphasic and Right Hemisphere
Damaged Subjects in Conversation

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The frequency and duration of six coverbal behaviors
were examined in two experimental groups and one control
group. Conversational samples of ten aphasic subjects, ten
right hemisphere damaged (RHD) subjects, and ten matched,
non-brain damaged (NBD) control subjects were scored for
frequency and duration of eye contact, head nod, head shake,

head tilt, smile and eyebrow raise. Only the frequency of smile was found to differ significantly; the RHD subjects smiled less often than either of the other two groups.

COVERBAL BEHAVIOR OF APHASIC AND

RIGHT HEMISPHERE DAMAGED

SUBJECTS IN CONVERSATION

by

JILL DUVALL

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TO THE OFFICE OF GRADUATE STUDIES:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The study of nonverbal behavior after cortical damage
has been extensive, but mainly limited to subjects with
aphasia. Several researchers have examined the gestural
abilities of aphasic patients (Cicone, Wapner, Foldi, Zurif
& Gardner, 1979; Duffy & Duffy, 1981; Peterson & Kirshner,
1981; Feyereisen & Seron, 1982; Daniloff, Noll, Fristoe &
Lloyd, 1982; and Behrmann & Penn, 1985). The focus of this
work has been a determination of whether or not patients
with aphasia, a language disorder, suffer from a
corresponding disorder of their gestural abilities.
Interest in the nonverbal behavior of patients with right
hemisphere damage (RHD) has been motivated by the
observation that communication does not proceed normally
after RHD despite the intact verbal ability of these
patients (Hier, Mondlock & Caplan, 1983; Burns, Halpner &
Mogil, 1985; Golper, 1985; Kirshner, 1986; Meyers, 1986;
Gorelick & Ross, 1987). Several studies have noted that
this group of patients particularly seems to display limited
facial expressiveness (Buck & Duffy, 1980; and Benowitz,
Bear, Rosenthal, Mesulam, Zaidel & Sperry, 1983). Other

forms of nonverbal movements accompanying speech have not been examined among RHD subjects.

The present study compared the frequency and duration differences in coverbal behaviors displayed by aphasic subjects, RHD subjects and nonbrain damaged (NBD) subjects when engaged in conversation. This study replicates methods from an earlier investigation which focused solely on aphasic speakers (Katz, Market & LaPointe, 1979).

PURPOSE

The purpose of this study was to examine for between group differences comparing aphasic subjects, RHD subjects and nonbrain damaged subjects with limited regard to six coverbal behaviors. The six behaviors were eye contact, head nod, head shake, head tilt, smile, and eyebrow raise.

It was hypothesized that the aphasic groups scores would not differ significantly (at p .01) from normals, while the RHD group would differ from normals and the aphasic group across each variable examined.

DEFINITIONS

Aphasia. A deficit in the ability to formulate, retrieve or decode the arbitrary symbols that make up language (Holland, 1977).

Coverbal. Gestures of the face, head and hands that accompany speech but do not stand on their own as meaningful (Markel, 1975).

Discourse. Conversation; also the art or manner of
        conversing (Webster, 1943).

Dyadic interactions. Communicative interaction in which
        there are two participants.

Linguistic. Of or pertaining to language or the study of
        language (Webster, 1943).

Nonverbal. All of those human responses that are not
        overtly manifested in spoken or written words (Knapp,
        1972).

CHAPTER II

REVIEW OF THE LITERATURE

INTRODUCTION

This literature review is divided into five sections: the first section examines coverbal behavior in human communication; the second section discusses the deficits associated with aphasia; the third section examines the behavioral and cognitive changes subsequent to right hemisphere damage (RHD); the fourth section examines coverbal behavior in aphasic patients; and the final section examines coverbal behavior after RHD.

LITERATURE REVIEW

Coverbal Behavior in Communication

Researchers in human communication have for many years underscored the importance of coverbal gestural behavior when speaking and listening. Any nonverbal behavior that accompanies speech was labeled as "kinesics" by Birdwhistell (1970). Birdwhistell observed that inappropriate nonverbal behavior makes it difficult to communicate successfully. As he stated, "We can bear inappropriate behavior only if we can anticipate the inappropriate behavior" (Birdwhistell, 1970).

Markel (1975) originated the term coverbal behavior, defining it as the gestures of the face, head and hands that accompany speech but do not stand on their own as meaningful. Markel examined the following coverbal gestures: head nods, head shakes, head tilts, eye contact, eyebrow raises, and smiles. Markel noted that these gestures tend to be conversational regulators in dyadic interactions.

Davis (1986) described gestural behaviors in dyadic conversation as important to the initiation and maintenance of topics, the recognition of who is the speaker and the regulation and management of conversational turns. He divided conversational gestures into two types: housekeeping (turn-taking, listener interest, maintenance of conversational roles) and substantive (linguistic conversational repairs).

Other authors have examined the role of coverbal behaviors. Hadar, Steiner, and Rose (1985) extensively studied the head movements of people involved in dyadic conversation. They concluded that during listening, head movements signal interest, attention, agreement, a desire for a speaking turn and impatience. On the expressive side of an interaction, head movements studied by Hadar, Steiner, Grant, and Rose (1984) were found to begin just before the initiation of speech both at the beginning of speaking turns

and at syntactic boundaries. They concluded that these head movements play a role in the regulation of conversational turns as well as marking meaning and emphasis in speech. These authors theorize that head movements may aid a speaker in the initiation of the complex motor movements needed for speech, leading them to propose utilizing these movements in the treatment of aphasic patients.

One can readily see the importance of coverbal behavior to successful interactions. They are essential to managing and maintaining conversational interactions. Discourse without these movements becomes ambiguous and disjointed.

Language Deficits Associated with Aphasia

Aphasia has been described as a deficit in the ability to formulate, retrieve or decode the arbitrary symbols that make up language (Holland & Reinmuth, 1982). This broad description includes not only oral speech and language but graphic, and presumably, gestural language as well.

The most commonly applied model of aphasic language dysfunction is that described by Wernicke in 1880. Love and Webb (1986) gave an account of the basic ideas of Wernicke's theories in which various areas of the left cerebral hemisphere are said to be associated with different language functions. Damage to specific areas will cause a characteristic deficit in some aspect of language

functioning. Nonfluent aphasias, characterized by sparse or telegraphic verbal output with rather good auditory comprehension, are usually associated with injuries to the left frontal cortex. The "speech areas" near the inferior left frontal motor strip areas are associated with motor programming for verbal output. Fluent aphasias are characterized by good oral motor ability and relatively impaired auditory comprehension. The damage that causes a fluent aphasia is usually posterior in the left temporo-parietal areas of the brain. This is the area primarily responsible for the sensory reception and decoding of speech and language.

Brookshire (1986), as well as Goodglass and Kaplan (1972), add two types of "transcortical" aphasia to Wernicke's classical syndromes. The transcortical aphasias are said to be the result of lesions which isolate the language areas from the rest of the cortex. Transcortical aphasias are marked by the intact ability of the patient to repeat what was said. Transcortical motor aphasia is marked by sparse verbal output. Transcortical sensory aphasia causes the patient to have fluent, empty speech.

Currently, aphasiologists tend to divide aphasia into two basic types: fluent and nonfluent, with subtypes under some of these (Brookshire, 1986). There are three types which are considered fluent aphasias. Wernicke's aphasia is

characterized by poor auditory comprehension, fluent but empty speech, good prosody, often correct grammar and often paraphasic speech. Conduction aphasia is said to be the result of a "disconnection" by a lesion to the arcuate fasiculus which is the associate pathway between the motor speech area and the comprehension area. Patients with this type of aphasia primarily have difficulty with repetition. Oral reading is also impaired. Sometimes considered a mild version of Wernicke's aphasia, anomic aphasia causes primarily word retrieval difficulties. Patients with this type of aphasia have mild comprehension problems and tend to talk around the specific words they are unable to retrieve. Nonfluent aphasia is usually described as synonymous with Broca's aphasia. Although the motoric problems are the most prominent features of Broca's aphasia, linguistic (language) problems may be present as well. According to Brookshire (1986), these patients tend to lose the ability to generate grammatical sentences, maintaining the use of content rich telegraphic utterances instead.

This has been a brief outline of the basic language deficits associated with aphasia. The deficits of the aphasic person are quite different from those of the RHD patient.

Cognitive Changes Associated with
Right Hemisphere Damage

Unlike persons suffering left hemisphere damage, right
hemisphere damage rarely leads to aphasia. These patients,
however, are known to have cognitive problems which may have
an indirect effect on communication.

Hier and co-workers (1983) identified 12 deficits
associated with right hemisphere damage after stroke. In
their study they examined 41 patients with lesions in the
right hemisphere following unilateral stroke. The most
common cognitive deficits identified in these patients were,
in descending order of occurrence: constructional apraxia,
unilateral spatial neglect in drawing, dressing apraxia,
left neglect, prosopagnosia, and anosagnosia. Ninety-three
percent of the patients studied demonstrated constructional
apraxia; the inability to copy block designs. The authors
noted that 85 percent of the patients neglected the detail
on the left side of the designs copied and drew more details
on the right side. Fifty-one percent of their subjects
demonstrated dressing apraxia, the inability to orient
clothing when dressing. Forty-six percent of the subjects
tested were judged to have left neglect, an inattention to
the left side of the patient's environment. Prosopagnosia
is the inability to recognize familiar faces; in this study
44 percent of the subjects could not identify pictures of
Presidents Carter and Reagan or Senator Edward Kennedy. The

least frequently noted deficit in this patient population was anosagnosia. Only 36 percent of the patients in the study demonstrated a denial of illness (anosagnosia).

Burns and her associates (1985) separate RHD cognitive deficits into five categories of clinical syndromes. Left neglect, anosagosia, and prosopagnosia fall into the category of visuoperceptual disorders. Visuomotor disturbances are defined as dressing disturbances and constructional apraxia. Burns also identifies affective and emotional alterations (discussed in the portion devoted to coverbal behavior after RHD) as a syndrome associated with RHD. The fourth and fifth categories are memory disorders and neuropsychiatric disorders. Memory disorders associated with RHD involve recall of visual material; after RHD some patients have difficulty remembering complex visual material and faces. Another form of memory disorder after RHD involves confusion over spatial orientation; patients will insist that an unfamiliar environment is, in fact, one they know very well. Neuropsychiatric disturbances following RHD can take the form of mania, visual hallucinations, and paranoia as well as acute confusional states.

Wapner, Hamby and Gardner (1981) noted that after RHD, patients have difficulty understanding complex linguistic material. The authors attribute this deficit to the inability to utilize context in written material to gain

meaning. The authors found RHD subjects unable to appreciate humor, figures of speech or affectively-toned material. These subjects had a tendency to focus on insignificant details, personalize stories or fail to comprehend the moral of a story. When the authors presented the subjects with incongruities in the text the subjects tended to deal with them by confabulating in order to fit the detail into the story rather than challenging the veracity of the text. Burns et al. (1985) attribute this inability to comprehend abstract language, metaphor, humor, proverbs, idiomatic language or emotional language as a tendency of the intact left hemisphere to interpret in a word-by-word fashion. Literal or concrete interpretation of abstract language will result if it is analyzed sequentially; an appreciation of the utterance as a whole and the context in which it occurs is needed to understand complex language.

A more broadly based deficit may underscore and connect these deficits. In the larger Hier and co-workers' (1983) study, a factor analysis was performed on the deficits they found in their 41 subjects. Three factors emerged. Factor I was paresis (the paralyses of the contralateral side), factor II was the visuospatial aspect and factor III was "inattention." This inattention factor was described as the inability to direct and sustain

attention. It was hypothesized that this deficit forms the basis for the denial of illness, the inability to recognize faces and constructional apraxia. Burns et al. (1985) wrote that this inattention may be an imperception rather than denial. These authors further explained that this may also be at the core of the observation that RHD patients tend to be impaired in the ability to express emotion. They postulate that there may be an imperception of emotion.

Meyers (1986) observed that the right hemisphere may be quite different in structure and anatomical correlates than the left hemisphere. Whereas abilities have been specifically linked to discrete areas of the left hemisphere, this is not necessarily the case with the right hemisphere. She has suggested that cognitive schema of the right hemisphere may operate quite differently from the left in that it is more diffusely organized. Burns and her associates (1985) note that the right hemisphere is responsible for synthetic reasoning and the left for analytic reasoning. The nature of right hemisphere abilities makes them more elusive to testing and pinpointing. Meyers does point out, however, that research in this area is relatively new compared to the elaborate localization studies that have been done with the left hemisphere and, comparatively, that much less is known about the right hemisphere.

Coverbal Behavior and Aphasia

Holland observed (1977) that many aphasic patients should not be able to communicate as much or as well as they actually do given the extent of their language impairments. She stated that, "Usually suprasegmental, gestural and contextual cues are quite heavily relied on by the aphasics I have observed." Communication can proceed in spite of limited language. According to Holland, communicative competence relies on more than intact language skills. In general, pragmatic skills are preserved in aphasia as the person continues to be able to convey communicative intent and obey the rules of discourse in a given context.

Collins (1983) wrote that patients with global aphasia retain an understanding of the supralinguistic parameters of speech such as emotional tone, body language and gestures. These patients are able to express surprise, anger, remorse and sorrow despite their global aphasia. Collins proposes that some nonverbal skills may be diversely represented in the cortex and therefore more resistant than linguistic skills to disruption by a focal lesion. These nonverbal skills may not require verbal mediation.

Daniloff et al. (1982) found that aphasic patients were able to recognize iconic gestural systems (Amerind) leading to the authors to conclude that the aphasia exhibited in their subjects was a disorder specific to the

linguistic system rather than a general representational disorder.

Behrman and Penn (1985) conducted a study of gestural abilities in a group of aphasic subjects. Their findings indicated that the nonverbal, gestural abilities which accompany speech may be retained in the face of linguistic deficits. Skill in the area of gesture accompanying verbal communication correlated poorly with standardized measures of aphasia in their study. Rather, type of aphasia was correlated with gestural ability. Subjects with nonfluent aphasias were more skilled at using gestures that aided communication and supported or substituted for their verbal output. Fluent subjects in this study tended to have vague, unintelligible gestures. Their gestures were judged to interfere with communication more often than those of the nonfluent subjects.

Peterson and Kirshner (1981) reviewed several studies of gestural ability in aphasic patients. They cited two points of view with regard to gestural ability in aphasic persons. Some researchers believe that deficits in gestural ability in this population are due to a central deficit in representational ability. Alternatively, several authors have suggested the deficit lies in the motoric aspect of aphasia; that is, the gestural deficits are a component of apraxia (Peterson & Kirshner, 1981). Peterson and Kirshner

concluded that gestural output may mirror speech output.
The person with a nonfluent aphasia may use sparse, simple,
singular, appropriate gestures whereas the person with a
fluent aphasia may use clustered and unclear gestures.

Glosser, Wiener and Kaplan (1986) found that the
gestural rate of their aphasic subjects (as a function of
time and as function of spoken words) did not differ from
normal controls. Further, they found that nonfluent aphasic
persons produced more gestures per word than either fluent
subjects or normal subjects.

Schienberg and Holland (1980) analyzed a ten-minute
sample of conversation between two fluent aphasic patients
with severe auditory comprehension deficits. They noted
that the two subjects retained the ability to follow the
rules of discourse in dyadic conversation. The patients
maintained turn-taking in spite of their deficits in self-
monitoring. Some of the turn-taking markers noted as
appropriate included the use of coverbal behaviors in the
conversation (e.g., head nodding to indicate agreement while
the other person is speaking). Although the linguistic, or
propositional, content of the conversation was inadequate,
the two aphasic speakers managed to retain an appropriate
conversational interaction. This point suggests that
communicative competence may be present in spite of

linguistic deficit, and that this communicative competence may be attributed to factors other than verbal skill.

Katz et al. (1979) investigated the coverbal behaviors of aphasic speakers and correlated them with language abilities. This study served as a model for the methods and areas examined in the present study. In the Katz et al. study, subjects were asked to comment on twenty topics while they were videotaped. The subjects were allowed to talk as long as they liked about each topic introduced by the examiner. The subjects were ten aphasic patients with Porch Index of Communicative Ability (PICA) (Porch, 1967) scores below the 85th percentile overall, at least three months post onset and with diagnoses of aphasia. Controls were matched for age and education. The videotapes were viewed and scored by two judges. Reliability measures indicated good agreement between the two judges. Occurrences and durations of six behaviors were tracked: eye contact, eyebrow raise, head tilt, head nod, head shake, and smile. Three behaviors were found to differ from normals. Duration of eye contact, head shake and head nod were longer for aphasic speakers than for normals. Eye contact duration correlated inversely with verbal performance on the PICA. They found that the lower the subjects' verbal subtest scores were, the longer the mean length of eye contact. The authors concluded that aphasic speakers seemed to be better

communicators than language users as their coverbal
behaviors appear to be unaffected by their linguistic
deficits.

Davis (1986) stated that even the most severely
impaired patient with Wernicke's type of aphasia can use
"housekeeping" types of gestures. He defined those as the
gestures that speakers use to indicate turn-taking and
interest on the part of the listener and for maintaining
conversational roles.

In the preceding section, several studies were
reviewed and a general picture emerges to suggest that most
aphasic speakers retain certain pragmatic skills that allow
them to be more able communicators than their verbal skills
would indicate. Some of this ability may be attributable to
nonverbal and coverbal skills.

Coverbal Behavior after Right Hemisphere Damage

Meyers (1984) stated that the patient with right
hemisphere damage (RHD) may be deficient, in a generalized
way, to appreciating experience itself. An impairment in
perception and the ability to grasp the essence of a given
situation may result in a feeling of unconnectedness with
the world that manifests itself in pragmatic difficulties.
Communication deficits will become most apparent when the
person is engaged in conversation. Meyers noted that these

patients demonstrate a "reduced sensitivity to the communicative situation and the pragmatic aspects of communication" (p. 75).

Burns and her co-workers (1985) have written an extensive treatment and assessment protocol for the RHD population. In their work, they outlined the communicative problems that can be associated with right hemisphere strokes. The primary communication deficit, according to these authors, is impaired pragmatic communication, both in the realm of the proposition (conveying information in context) and in the performative (use of nonverbal as well as verbal aspects of communication to convey messages). The RHD person tends to disregard the conventions of discourse. Information rendered may violate the presuppositions of the two speakers. The information may be overly detailed, tangential and personal. In general, the speaker with RHD shows disregard for the listener's interest, knowledge and experience. The RHD patient demonstrates deficits in his nonverbal communication: lack of eye contact; facial expression; and failure to use the "regulators" of conversational turn-taking. Burns defined regulators as shifts in eye contact and head movements which indicate the listener's interest level and signal turn-taking or topic-shifting. These are coverbal aspects of communication.

Several studies to date have implied that right hemisphere disease is associated with reduced facial affect. Buck and Duffy (1980) showed that judges consistently rated RHD patients as nearly as inexpressive in their facial expression as subjects with Parkinson's disease and much less expressive than aphasic subjects. Kirshner (1986) stated that RHD patients tend to be unemotional or apathetic, unself-conscious, and generally have a flat affect as opposed to left hemisphere damaged (LHD) patients. Emotional content will often aid the comprehension ability of the patient with LHD whereas the RHD patient may entirely miss the emotional aspect of a message but readily perceive the literal content of the message.

In a study by Gorelick and Ross (1987), 14 RHD subjects were studied. The purpose of the study was to determine the ability of these patients to interpret and express affective states through prosody and facial gesture. Twelve of these subjects were judged to be impaired in the ability to either imitate or create an emotional expression through prosody and facial expression or to interpret the affective state of the examiner. The examiners used the same linguistic material with differing intonation and facial expression to assess these patients, eliminating the possibility of grasping meaning from the propositional content alone. To assess expressive ability, the

researchers asked the subjects to alter their expressive
prosody and facial expression to either match the examiner's
or to express a prescribed emotion. All but two of the
subjects were impaired in some or all of these aspects. The
authors concluded that damage to the right hemisphere often
impairs a person's ability to express and/or interpret
meanings of oral language through facial expression or
intonation.

Ross and Mesulam (1979) presented two cases of
patients unable to express emotion after right hemisphere
strokes. They described the patients as having
expressionless faces and monotonous voice qualities. They
speculated that the right hemisphere might have a dominant
role in the modulation of the affective components of
speech.

Benowitz and associates (1983) studied the comparative
abilities of aphasic patients, RHD patients and normals to
evaluate the meaning of a person's facial expressions. They
found the RHD subjects unable to interpret films of a person
expressing several emotions without benefit of accompanying
audio tape. Aphasic patients and normal controls were
unimpaired in this ability. They found the RHD subjects to
have deficits in the perception of facial expression, in the
interpretation of intonational qualities of the voice and in
the appreciation of emotional stories and humor. The

authors concluded that the right hemisphere is critical in evaluating the significance of social interactions through nonverbal cues and particularly through facial expressions.

The literature suggests that a person sustaining damage to the left hemisphere may suffer from impaired language, but not necessarily impaired communication. Conversely the patient with RHD may not demonstrate language disturbance, but he may suffer from communicative impairment as a result of pragmatic deficits. Coverbal behaviors form an important component of pragmatic ability; they are essential to effective discourse.

CHAPTER III

METHODS

SUBJECTS

Two experimental groups and one normal control group
of ten subjects each were drawn from a population of brain
injured and normal speakers at the Portland Veteran's
Administration Medical Center (PVAMC). All three groups
were comprised of men, aged 45-70 years. The two
experimental groups contained subjects who: 1) had
unilateral, thrombo-embolic cerebrovascular accidents; 2)
were at least three months post onset at the time of
videotaping; and 3) had computerized axial tomography (CT)
scans and/or neurological examinations and histories
indicating a unilateral infarction. All subjects were
native English speakers.

The aphasic subjects in this study had a "functional"
level of communicative ability based on their PICA Overall
percentile scores. The Overall scores for these subjects
fell between the 53rd and the 94th percentile. All subjects
were premorbidly right handed with the exception of one left
handed, left hemisphere-injured subject included in the

aphasic group, as he apparently had a left hemispheric dominance for language.

All subjects in the right hemisphere damaged (RHD) group were screened for any subtle evidence of aphasia and were found to have no language deficits. All of the RHD subjects were right-handed males. Both experimental groups had equivalent distributions with regard to anterior versus posterior sites of lesion. (See Appendix for detailed descriptions of the three groups.)

The non-brain damaged (NBD) group included subjects selected to match the brain damaged subjects across age, education level, race and occupation level. The NBD subjects were drawn from patients, volunteers and employees of the PVAMC.

DESIGN

All subjects were interviewed prior to the videotaping and asked to identify three events or circumstances to discuss during the videotaping. They were asked to be prepared to discuss a time in their lives when they were very happy, an event or circumstance when they were very sad and something that makes them very angry. All subjects were advised as to the nature of the study and signed video taping release documents. The subjects were asked to converse for a minute and a half on each preselected topic.

Subjects were prompted when to begin. Every sample required some degree of interaction from the interviewer to keep the subject talking about his chosen topic for the full time. The samples were conversational rather than monologues. The camera was located just above the interviewer's right shoulder. The subjects' heads and upper chests were in view. (See Figures 1 and 2 for diagrams of the interview configuration.)

Each videotaped segment was edited to be exactly 90 seconds long. The taped segments were then randomized across both topics and subjects. The experimental samples contained the video-only portion of the recording with a total of 90 randomized segments. In addition, ten samples were presented twice as a means to later examine intra-rater reliability. To establish inter-rater reliability, two judges viewed ten of the samples and their scores were compared with those of the primary investigator.

The video tapes were reviewed at least six times to count and time the occurrences and durations of eye contacts, eyebrow raises. Eye contact was defined as when the subject looked the interviewer in the eye, i.e., each time the subject looked away and re-established eye contact, the judge tallied an event of eye contact. The clock was stopped each time the subject looked away and restarted when the subject returned to the eye contact position. Head nod
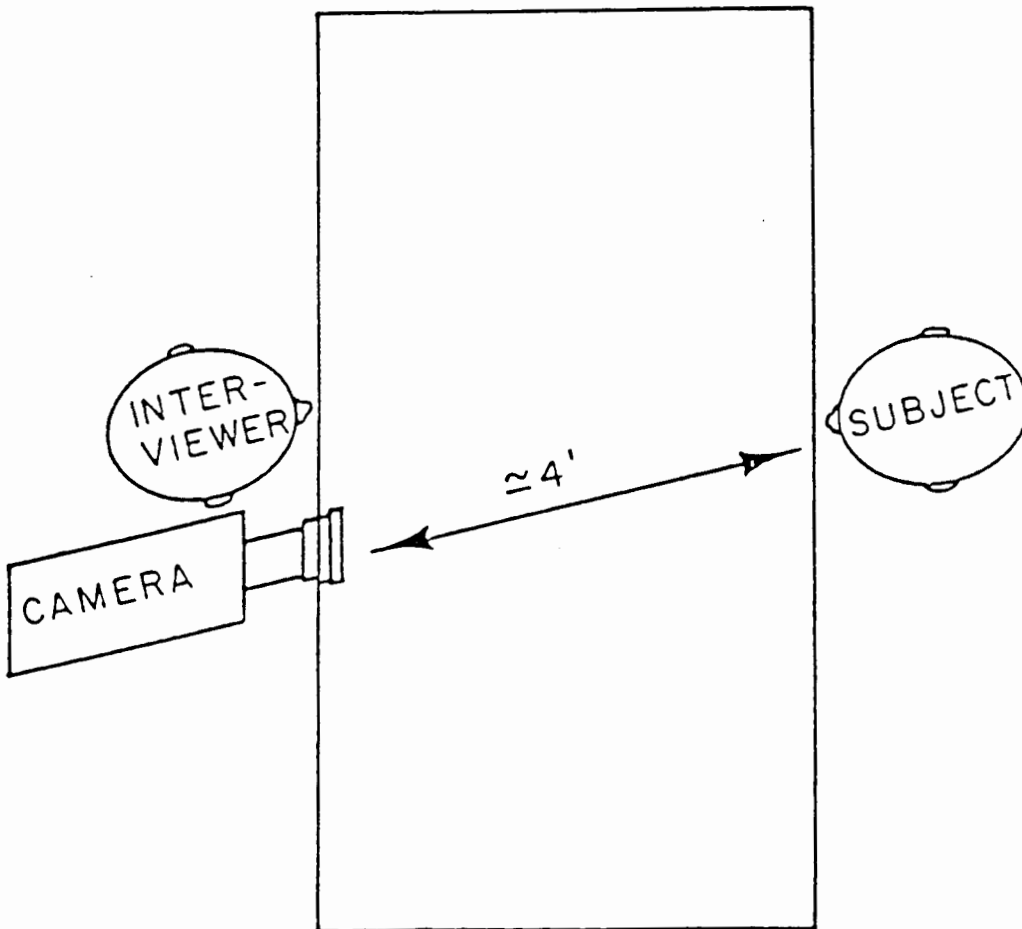
Figure 1. Illustration of Positioning During the Interview: Top View.
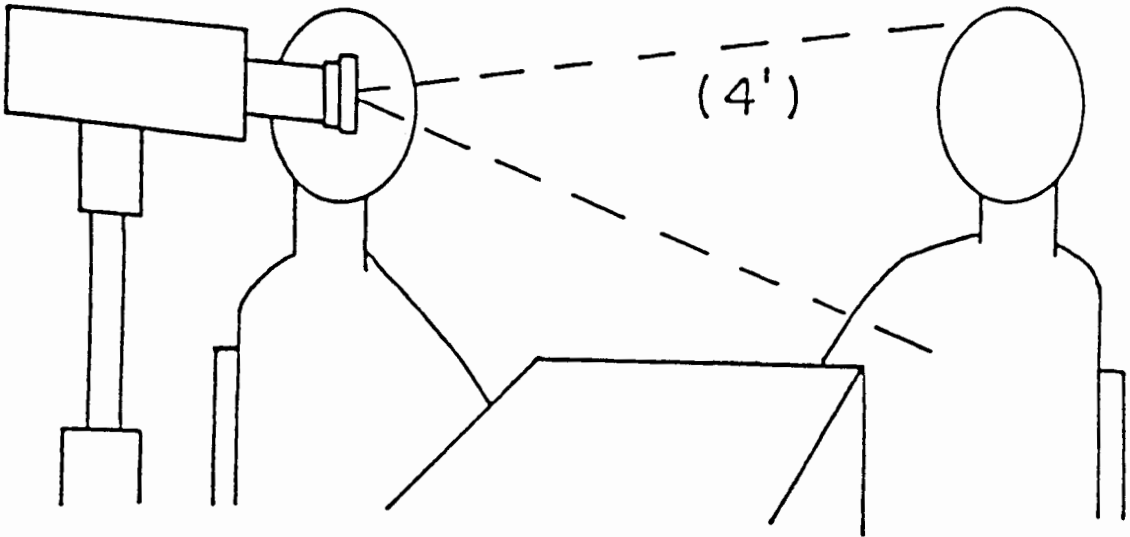
Figure 2. Illustration of Positioning During the Interview: Side View.

was defined as the vertical movement of the head. Head shake was defined as the horizontal, side-to-side movement of the head. Head nods and shakes were counted as single events from the start of the movement to the cessation of movement rather than counting individual nods or shakes. Head tilts were defined as angled movements of the head from the neck up, not to include inadvertent head tilts resulting from posture shifting. Smiles were defined as the upward turning of the corners of the mouth. Eyebrow raises were defined as the upward motion of the eyebrows. A training tape was prepared to allow the judges to practice scoring prior to the actual data collection. This training tape was comprised of subjects who were not included in the study. Judges were shown some examples of the six behaviors but not taken step-by-step through an entire sample. Judges were able to count and time the events simultaneously with a push button lap counter (used in sports activities) and a stop watch with "time-in, time-out" capability. The lap counter was held in the left hand and the stop watch in the right. The judge would press both the counter and the stop watch simultaneously when a particular behavior occurred and stop the clock when the behavior ended. The stop watch, a Cronus, kept accumulated time so that at the end of a tape segment the total time could be recorded. This method of scoring allowed the judge to count and time without looking

away from the screen. The primary experimenter was unaware of group membership during the scoring as no identifying information was contained in the recorded samples.

Data Analysis

The frequency and duration scores for each segment were sorted according to subject number; the scores from the subjects' three different segments were totaled across the three samples for the data analysis. After frequency and duration scores were computed the data were sorted by group. Means were computed for each group's performance across each of the twelve variable (six frequency variables and six duration variables). One way analyses of variance (ANOVA) were applied to group x frequency and group x duration comparisons in each of the six behaviors for a total of twelve analyses. An F statistic was applied to identify significant differences at $p < .01$. The Tukey test was applied as well to each ANOVA to examine for between group differences. Intra-rater and inter-rater reliabilities were examined with percentage of agreement computations.

Reliability

Inter-rater reliability was established on a percentage of agreement basis. Two judges' scores were compared with those of the primary investigator on ten samples. Frequency measures had to be plus or minus two to

be considered an agreement. Total duration counts had to be within five seconds on eye contact and three seconds on all other measures to be considered in agreement. The agreement percentages for each variable were averaged across the ten samples for an overall agreement percentage in each variable (see Table I). Judges more consistently agreed on frequency measures; the range of percentages being from 83 percent agreement on head tilt frequency to 100 percent on smile frequency. Agreement on duration measures ranged from 56 percent to 100 percent, with head tilt again having the lowest rate of duration agreement.

Intra-rater reliability was established by comparing the scores of ten repeated samples recorded by the primary experimenter. The same system of percentage of agreement was used. Agreement was 100 percent for all variables with the exception of eye contact frequency (90%) and head tilt duration (90%).

TABLE I

INTER-RATER RELIABILITY: PERCENT
OF AGREEMENT AMONG THREE JUDGES

VARIABLE	FREQUENCY	DURATION
Eye Contact	90%	73%
Head Nod	93%	90%
Head Shake	76%	100%
Head Tilt	83%	56%
Smile	100%	93%
Eyebrow Raise	96%	86%

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

Following the completion of frequency and duration measures by the primary investigator and judges scoring for reliability comparisons, all raw scores for each subject number were summed and sorted according to group membership. Mean values were then computed across each variable (Tables I-III). Although the data from Tables II, III and IV show the RHD group's means to be lower on nearly all of the coverbal behaviors measured, the majority of these differences were not found to be statistically significant.

Of the 12 variables examined with ANOVAs, only one yielded a significant difference between the groups (Tables V and VI). The analysis of group x frequency of smile was significant at the $p < .01$ level (Table V). The Tukey Test for between group differences revealed the source of variation to be a difference between the RHD group and the NBD group at the $p < .01$ level (Table VII). The RHD subjects smiled less frequently than both the NBD group and the aphasic group. The comparisons of the aphasic group with the NBD group showed no significant differences.

TABLE II

RAW SCORES AND MEANS FOR NON-BRAIN DAMAGED GROUP

SUB#	EC FR	EC DU	HN FR	HN DU	HS FR	HS DU	HT FR	HT DU	S FR	S DU	EBR FR	EBR DU
13	31	105	13	10	7	2	15	77	7	36	4	2
14	23	149	12	8	8	5	4	3	9	23	33	62
19	25	130	10	7	5	3	1	3	5	19	10	84
25	39	80	5	2	8	1	13	37	2	10	10	61
27	46	200	17	12	8	6	2	1	21	19	6	7
29	58	101	35	21	4	2	6	13	10	18	20	32
30	38	186	9	4	8	4	14	81	0	0	20	18
31	41	96	13	13	22	19	3	2	5	27	4	29
33	52	143	10	5	8	6	10	11	15	47	23	73
35	38	169	27	21	17	15	21	27	7	33	2	2
MEAN FR	39.1		15.1		8.8		8.9		8.1		13.2	
MEAN DU		135.9		10.3		6.3		26.6		23.2		37.0

EC = Eye Contact   HN = Head Nod   HS = Head Shake   HT = Head Tilt   S = Smile

EBR = Eyebrow Raise   FR = Frequency   DU = Duration, time given are in seconds

TABLE III

RAW SCORES AND MEANS FOR APHASIC GROUP

SUB#	EC		HN		HS		HT		S		EBR	
	FR	DU	FR	DU	FR	DU	FR	DU	FR	DU	FR	DU
2	22	84	4	6	3	2	8	24	12	63	9	13
3	25	112	10	5	6	3	8	10	3	21	4	9
4	37	211	17	23	21	21	1	1	12	52	10	9
8	29	87	10	5	7	4	12	20	1	1	9	6
10	37	93	19	22	7	8	5	6	6	29	21	47
12	37	121	7	3	7	6	4	6	5	9	28	136
18	17	23	1	1	4	2	3	18	2	7	4	5
20	29	194	15	11	2	1	2	1	14	112	22	70
21	56	128	16	8	11	8	14	96	5	21	1	1
28	31	132	11	9	7	5	3	16	5	8	18	88
MEAN FR	32.1		11.0		7.5		5.9		6.5		12.6	
MEAN DU		118.5		9.3		6.0		19.7		32.3		38.4

EC = Eye Contact   **HN** = Head Nod   **HS** = Head Shake   **HT** = Head Tilt   **S** = Smile
EBR = Eyebrow Raise   **FR** = Frequency   **DU** = Duration, time given are in seconds

TABLE IV

RAW SCORES AND MEANS FOR RIGHT HEMISPHERE DAMAGED GROUP

SUB#	EC FR	EC DU	HN FR	HN DU	HS FR	HS DU	HT FR	HT DU	S FR	S DU	EBR FR	EBR DU
9	34	129	8	4	1	1	2	8	2	5	0	0
11	17	232	16	14	9	10	4	16	0	0	14	32
15	21	37	10	7	2	3	2	2	5	89	13	26
16	16	190	11	11	2	4	1	1	0	0	8	85
17	21	148	1	1	0	0	1	3	4	13	0	0
22	58	191	10	6	10	7	10	48	1	8	9	5
23	13	53	1	0	2	1	0	0	0	0	0	0
24	32	129	11	14	2	0	8	12	0	0	18	37
26	28	101	2	1	2	1	3	16	1	5	2	1
34	34	57	1	1	2	2	0	0	0	0	0	0
MEAN FR / **MEAN DU**	27.4	126.7	7.1	5.9	3.2	2.9	3.1	11.5	1.3	12.0	6.4	18.6

EC = Eye Contact   **HN** = Head Nod   **HS** = Head Shake   **HT** = Head Tilt   **S** = Smile

EBR = Eyebrow Raise   **FR** = Frequency   **DU** = Duration, time given are in seconds

TABLE V

ANALYSES OF VARIANCE (ANOVA) ON
GROUPS X FREQUENCY OF SIX
BEHAVIOR VARIABLES

SOURCE	SUMS OF SQUARE	DEGREES OF FREEDOM	MEAN SQUARE	F	p VALUE
Eye Contact	694.867	2	347.433	2.54	.10
	3717.300	27	137.678		
Head Nod	320.067	2	160.033	3.26	.05
	1323.800	27	49.030		
Head Shake	171.800	2	85.900	3.26	.05
	709.700	27	26.285		
Head Tilt	168.267	2	84.133	3.29	.05
	688.700	27	25.507		
Smile	252.800	2	126.400	6.10	.01
	559.500	27	812.300		
Eyebrow Raise	283.467	2	141.733	1.81	.18
	2116.400	27	78.385		

TABLE VI

ANALYSES OF VARIANCE (ANOVA) ON
GROUPS X DURATION OF SIX
BEHAVIOR VARIABLES

SOURCE	SUMS OF SQUARE	DEGREES OF FREEDOM	MEAN SQUARE	F	p VALUE
Eye Contact	408.800	2	204.400	.07	1.00
	79061.500	27	2928.204		
Head Nod	106.400	2	53.200	1.22	.30
	1171.100	27	43.374		
Head Shake	70.867	2	35.433	1.33	.28
	721.000	27	26.704		
Head Tilt	1142.867	2	571.433	.903	1.00
	17089.000	27	632.926		
Smile	2067.800	2	1033.900	1.46	2.50
	19081.700	27	706.730		
Eyebrow Raise	2441.867	2	1220.933	.96	1.00
	34362.800	27	1272.696		

TABLE VII

TUKEY TEST FOR INTERGROUP DIFFERENCES
ON GROUPS AND SMILE FREQUENCY

For Group 1 (NBD) vs. Group 2 (Aphasic):	Q = 1.111
For Group 1 (NBD) vs. Group 3 (RHD):	Q = 4.724
For Group 2 (Aphasic) vs. Group 3 (RHD):	Q = 3.612
Degrees of Freedom: 27	p at .01 = 4.450
	p at .05 = 3.490

Three frequency measures (head nod, head shake, and
head tilt) approached a level of significant difference
between the groups (Table IV) with probability values at,
but not less than, .05. None of the duration scores
differed between groups (see Table V).

DISCUSSION

The results of this study are interpreted to indicate
that the initial hypothesis that the RHD subjects would
demonstrate significantly different scores in frequency and
duration of coverbal behaviors than normals and aphasic
subjects is rejected. Although on several measures the mean
scores of the RHD subjects were lower than either the

aphasic group or the NBD group, there was a great deal of variation within each group and thus the differences were not significant.

The one variable that was found to be significant was the relatively reduced frequency of smiles in the RHD compared to normals and aphasic subjects. The mean frequency of smiles for the NBD group was 8.11; for the aphasic group it was 6.5, but for the RHD group it was only 1.3. Half of the subjects in this group did not smile at any time during the four and a half minutes of video taped conversation. Averaging the scores of just those RHD subjects who did smile resulted in a mean score of only 2.6.

Among all of the coverbal behaviors studied, the smile variable was the only affective variable studied. All the other behaviors could be neutral with regard to conveying emotion. This leads to speculation that perhaps the communicative deficits of the RHD patient are more broadly based in a deficit of emotional expression rather than strictly a deficit in coverbal behavior. This theory would be supported by the research of Ross and Mesulam (1979), Buck and Duffy (1980), Hier et al. (1983), Benowitz et al. (1983), and Gorelick and Ross (1987). These studies have all suggested the RHD patients have deficits in the ability to express emotion as well as in interpreting the emotional expression of others. The present study found that RHD

subjects were not remarkably less animated in any behavior studied except for the one conveying a specific emotion.

The smile variable was also the most reliably measured variable of the six behaviors. Judges agreed 100 percent of the time on the frequency and 93 percent of the time on the duration of smiles.

The other experimental group in this study, the aphasic group, did not differ from the NBD on frequency or duration of any variable. The raw scores of the aphasic group were very close to those of the NBD group on all behaviors. This supports the Katz et al. study (1979) finding of no significant differences, with regard to coverbal behavior, between aphasic and normal speakers. By abstraction, this might also account for some of the turn-taking ability demonstrated by the two aphasic subjects in Schienburg and Holland's study (1980). The study only briefly mentioned head nodding as an encouragement for the other party to continued talking, since coverbal behavior was not the intended focus of their study. But perhaps the intact coverbal behaviors of the aphasic subjects contributed to their conversational turn-taking abilities. According to Davis (1986), the very coverbal behaviors examined in the present study are those essential to the regulation of turns in a dyadic conversation. The findings of the present study support the observations by Schienburg

and Holland (1980) that aphasia does not interfere with other (nonlanguage) aspects of discourse behavior.

The NBD group showed a great deal of variability with regard to frequency and duration of coverbal behaviors. Smiling frequencies, for example, ranged from 0-21. Eyebrow raises ranged in frequency from 2-33. There are no normative studies available with which to compare these subjects; one would speculate from these data that people in the course of conversation tolerate a wide range of frequencies and durations of coverbal behavior without suspecting an affective deficiency. All of the normal subjects (as well as the aphasic subjects) made many facial and head movements of one kind or another during the taped conversations. Some individual RHD subjects, however, made almost no movements of any kind during the samples. Subject number 23, for example, made only 13 eye contact moves, one head nod and one head shake during the entire four-and-a-half minute sample; he did not smile or raise his eyebrows at any time. It is doubtful that anyone would view this subject's coverbal style as normal.

This study demonstrated that a group of RHD subjects had reduced (with differences approaching significance) frequencies of movement in conversational interactions when compared to subjects matched for age, sex, and education with no brain injury and subjects with aphasia. These

differences were not remarkable with the exception of the
frequencies of smiles. Larger groups of subjects might help
to determine if these differences were notable trends. The
differences in frequency of smiles are consistent with
previous studies suggesting RHD persons have reduced
emotional facial gestures.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

The purpose of this study was to compare variations in coverbal behaviors among aphasic subjects, right hemisphere damaged (RHD) subjects, and nonbrain damaged (NBD) subjects. Ten aphasic subjects, ten RHD subjects and ten NBD subjects were videotaped while in conversation. The frequency and duration of six head and facial movements were tallied including: eye contact, head nods, head shakes, head tilts, smiles and eyebrow raises. Analyses of variance were applied to the individual totals across variables and between group differences were tested. The ANOVAs resulted in only one statistically significant difference at the .01 level. The RHD group was found to smile significantly less than both the aphasic group and the normal control groups $(p < .01)$. The frequency mean scores for three other nonverbal behaviors were low in the RHD group in comparison to the two groups, but the difference variation did not quite reach statistical significance. The aphasic group's scores were not statistically different from those of the normal group.

CLINICAL IMPLICATIONS

The relatively intact coverbal abilities of aphasic subjects, as demonstrated in this study, may be viewed as encouragement for clinicians to utilize more pragmatic methods of aphasia treatment. The speech clinician, the family members, as well as the patient himself/herself tend to focus on the patient's linguistic deficits and discount the coverbal communicative ability the patient retains. Of course the linguistic deficits of these patients need attention, but a greater emphasis on general communication might make treatment more effective.

Another implication for clinicians might be in the counseling of patients and their families concerning the affective changes after RHD. Patients should be encouraged to be aware of their decreased affect and how it might effect those around them. Families should be discouraged from making assumptions about the internal emotional state of the patient without verbally confirming their beliefs. The RHD patient enjoys the advantage of intact linguistic ability; however, as Wapner et al. (1981) suggested, these patients tend not to appreciate subtleties. In the process of normal language development, children learn at a young age that it is inappropriate to comment directly on someone's behavior, but that it is sometimes acceptable to do so indirectly or subtly. Some patients with RHD lose

this distinction, between direct and indirect language. In counseling patients and their families, the clinician might explain these changes to them and emphasize the need for directness when discussing their affective behavior.

IMPLICATIONS FOR FURTHER RESEARCH

This study objectively assessed components of facial expressions and head movements in certain coverbal behaviors. By collecting data on a limited range of behaviors thought to be usually exhibited, the hope was to find a difference in some of these behaviors to account for the subjective observation that patients with language impairment are able to communicate effectively while RHD patients with intact language often experience disruption in effective communication. This was a quantitative rather than a qualitative analysis. The more common method of assessing facial expression is to have judges make subjective assessments of a subject's expressiveness. The intention of this study was to quantify head and neck movements. Throughout the data collection phase of the experiment, it was the feeling of the primary experimenter, as well as the judges, that the critical elements that differentiated the groups might be more subjective. Perhaps the differences lie in the fact that there are a wide range of movements possible to express not only emotion but also

affiliation with the conversational partner. Perhaps subjective listener assessments are more closely analogous to perceptions of disorders in coverbal behaviors. There should be research comparing subjective analyses with frequency analyses.

Another area for research is an investigation of the internal emotional states of the RHD patient population relative to their affect. Does the outward expression differ from the subjective feeling of the patient? A limitation of the present study was the small sample size, only ten subjects in each of the groups. A larger sample could assess how coverbal behavioral changes interact with its relationship to other cognitive problems, the location of cortical damage, severity of aphasia or type of aphasia. This study examined occurrences and durations of certain coverbal behaviors. To place these behaviors in the context of communication, a follow-up investigation could explore the content of the verbal statements that corresponded to each coverbal movement. Is there dysynchrony or movement occurring at inappropriate junctures or lacking when they ought to occur? These issues await further study.

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APPENDIX

SUBJECT PROFILES

RACE, HANDEDNESS AND PREVIOUS OCCUPATIONS
OF APHASIC SUBJECTS

Subject #	Race	Handedness	Previous Occupation
002	C	Left	Speech Pathologist
003	C	Right	Career Coast Guard
004	C	Right	Salesman
008	C	Right	Owned/Managed Business
010	C	Right	Teacher
012	C	Right	Salesman
018	C	Right	Sawmill Worker
020	B	Right	Maintenance Engineer
021	C	Right	Postal Clerk
028	C	Right	Cab Driver

AGE AND MONTHS POST ONSET
OF APHASIC SUBJECTS

Subject #	Age	Months Post Onset
002	62	5
003	53	51
004	59	17
008	63	11
010	70	14
012	62	36
018	67	38
020	50	12
021	62	5
028	58	3
	Mean = 60.6 Range = 50-70	19.2 3-51

LOCATION OF INFARCTION, TYPE OF APHASIA,
PICA OVERALL PERCENTILES, AND YEARS
OF EDUCATION OF APHASIC SUBJECTS

Subject #	Location of Infarction	Type of Aphasia	PICA O.A. Percentiles	Years of Education
002	Posterior	Fluent	86	18
003	Ant./Post.	Nonfluent*	63	12
004	Posterior	Fluent	83	13
008	Posterior	Fluent	94	12
010	Anterior	Nonfluent*	77	16
012	Anterior	Nonfluent*	78	13
018	Posterior	Fluent	75	11
020	Anterior	Nonfluent*	73	12
021	Ant./Post.	Fluent*	67	13
028	Anterior	Nonfluent*	88	16

Mean = 78.4   13.6
Range = 63-94   11-18

*Subjects with facial asymmetry

RACE, HANDEDNESS AND PREVIOUS OR CURRENT
OCCUPATIONS OF NORMAL SUBJECTS

Subject #	Race	Handedness	Occupation
013	B	Left	Career Army
014	C	Right	Army Chaplain
019	C	Right	House Painter
025	C	Right	Career Navy
027	C	Right	Salesman
029	C	Right	High School Counselor
030	C	Right	Construction Worker
031	C	Right	Teacher
033	C	Left	Real Estate Broker
035	C	Right	Researcher

AGES AND YEARS OF EDUCATION
OF NORMAL SUBJECTS

Subject #	Age	Years of Education
013	49	14
014	74	19
019	72	8
025	57	16
027	51	12
029	59	18
030	60	9
031	62	16
033	66	12
035	49	18
	Mean = 59.9	14.2
	Range = 49-74	8-18

RACE, HANDEDNESS AND PREVIOUS OCCUPATIONS
OF RIGHT HEMISPHERE DAMAGED SUBJECTS

Subject #	Race	Handedness	Occupation
009	C	Right	Construction Worker
011	C	Right	Salesman
015	C	Right	Commercial Fisherman
016	C	Right	Accountant
017	C	Right	General Contractor
022	C	Right	Career Navy
023	C	Right	Salesman
024	C	Right	Motel Manager
026	C	Right	Social Worker
034	C	Right	Career Coast Guard

AGE AND MONTHS POST ONSET OF RIGHT
HEMISPHERE DAMAGED SUBJECTS

Subject #	Age	Months Post Onset
009	57	3
011	63	60
015	64	6
016	67	3
017	56	42
022	45	3
023	39	3
024	58	3
026	58	36
034	67	48

Mean = 57.4   20.7
Range = 39-67   3-60

LOCATION OF INFARCTION AND YEARS OF EDUCATION
FOR RIGHT HEMISPHERE DAMAGED GROUP

Subject #	Location of Infarction	Years of Education
009	Posterior	12
011	Anterior*	13
015	Anterior*	12
016	Ant./Post.*	14
017	Posterior	12
022	Ant./Post.*	12
023	Posterior	12
024	Anterior*	13
026	Ant./Post.	18
034	Anterior	14

Mean = 13.4
Range = 12-18

*Subjects with facial asymmetry