A LONGITUDINAL STUDY OF DISCOURSE

IN ADULTS WITH ALZHEIMER'S

DISEASE

By

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CHAPTER I

INTRODUCTION

Alzheimer's Disease has been extensively studied since its identification in 1906 (Rau, 1993). However, the study of language changes, particularly at the discourse level, is a fairly recent subject of research, with most research taking place in the last ten years (Tomoeda & Bayles, 1993). An overview of the studies indicates the language of those with dementia of the Alzheimer's type (DAT) is generally marked with vague and empty speech, problems with turn-taking, verbosity, reduced cohesion and coherence, lowered informational content, and topic management difficulties (Mentis, Briggs-Whittaker, and Gramigna, 1995).

Some studies have described the characteristics of discourse in Alzheimer's disease alone (Bayles, Tomoeda & Trossett, 1992; Hamilton, 1994). Other studies have compared the discourse of those with DAT to either normal controls (Bayles, Tomoeda, & Trosset, 1992; Ripich & Terrell, 1988; Ripich, Vertes, Whitehouse, Fulton, & Ekelman, 1991; Smith, Chennery, & Murdoch, 1989) or to subjects with disordered language due to other etiologies

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such as Huntington's Disease or Traumatic Brain Injury (Fromm & Holland, 1989; Illes, 1989).

The majority of discourse research in Alzheimer's Disease has used a single discourse task to examine a specific area of discourse such as self-monitoring (McNamara, Obler, Au, Durso & Albert, 1992) or cohesion and coherence (Appell, Kertesz, & Fisman, 1982).

Previous research studies of discourse in Alzheimer's Disease have primarily elicited samples by engaging the subjects in conversation (Hamilton, 1994) or by having them describe pictures (Tomoeda & Bayles, 1993).

Studies attempting to show change over time have been mainly cross-sectional. Researchers have used samples of mildly, moderately, and severely impaired individuals with Alzheimer's Disease in order to show changes in linguistic abilities at various stages of the disease (Ehrlich, 1994). Very few studies have been longitudinal in nature (Hamilton, 1994; Tomoeda & Bayles, 1993).

With these design differences in mind, the following characteristics of discourse have been noted. Ripich, Vertes, Whitehouse, Fulton and Ekelman (1991) compared the conversation of eleven subjects with dementia of the Alzheimer's type to normally aging elderly individuals. Subjects with Alzheimer's Disease were found to take shorter

turns, use more requestives and less assertives, and have significantly more unintelligible utterances than their normally aging counterparts.

In one of the earliest studies, Appell, Kertesz and Fisman (1982) examined the speech and language of twenty-five patients with Alzheimer's Disease at the Psychogeriatric Unit of London Psychiatric Hospital by using the Western Aphasia Battery (Kertesz, 1980) and a modification of the Boston Diagnostic Aphasia Examination (BDAE)(Bayles & Tomoeda, 1991). These patients (at varying stages of DAT) were compared to patients who had experienced strokes and normal subjects. Appell, et al. reported that the spontaneous speech of those with Alzheimer's Disease was marked with circumlocutions and jargon. Those in later stages of Alzheimer's (i.e., those with lower cumulative test scores) had speech characteristic of syllabic perseverations, shouting, laughter at inappropriate times, and mutism. Additionally, they found that the severity of language impairment correlated with the length of hospitalization. There was no relationship between the degree of language impairment and the subject's age.

A cross-sectional study was conducted by Fromm and Holland (1989), which compared subjects in the mild and moderate stages of Alzheimer's Disease to each other and to normal elderly, those with Wernicke's aphasia, and depressed

elderly subjects. The subjects were administered the
Communicative Abilities in Daily Living (Holland, 1980),
which is a test of functional language to be used with
adults who have incurred some type of brain injury. Those
in the mild stage of Alzheimer's Disease scored
significantly better (p<.05) than those in the moderate
stage of Alzheimer's Disease in the following categories:
role-playing (subject and examiner assume roles in everyday
situations), nonverbal/symbolic (identify the correct
symbol, such as the four of clubs from a visual field of
four cards), read/write/calculate (perform simple reading
tasks and calculations in a given context), divergencies
(produce logical solutions based on information presented),
and sequential relations (perform a sequence of actions or
solve a series of causal relationships). Both those with
mild and moderate Alzheimer's Disease scored highest in the
areas of social convention (response to apologies,
compliments, etc.), role playing, and speech acts
(explanation, correction of incorrect information, etc.),
which all include overlearned behaviors of communication.
The tasks that presented the most difficulty to both DAT
groups were those that required them to generate logical
alternatives from information (divergencies) and
interpreting metaphors (humor/metaphor/absurdity).
Additionally, they often gave answers indicating that they

failed to comprehend the gist of the question, giving answers that were incomplete, vague or irrelevant.

Hier, Hagenlocker, and Shindler (1985) examined twenty-six subjects with DAT as well as subjects with stroke-related dementia and normal controls. They compared the subjects' performance on the description of the Cookie Theft picture (BDAE) and found that subjects with DAT exhibited empty speech, unclear anaphoric references, and increased use of pronouns (as opposed to the actual names of objects). Further, both the subjects with DAT and stroke-related dementia exhibited decreased ability to make relevant observations, as compared to normal controls.

In comparing early and late stages of DAT, Hier, et al. (1985) found that those in the late stages of Alzheimer's had significantly fewer relevant observations, significantly more empty words and errors in prepositions, and were significantly less concise in the information conveyed.

Illes (1989) compared ten male subjects with Alzheimer's Disease to subjects with Huntington's Disease, Parkinson's Disease, and normal subjects. In each group of ten, half were in early stages of their respective disease, and half were in late stages. She obtained language samples by engaging the subjects in conversation about autobiographical information. These discussions ranged from two to eight minutes in length, depending on the

responsiveness of the subject. Her study found that the discourse of the subjects with DAT was marked by vocal temporal interruptions (pauses, filled pauses, interjections, revisions, abandoned phrases, etc.), paraphasias, and closed class phrases. Further, those in early stages of DAT had more words per minute, lower proportion of self-corrections and aborted phrases, and fewer neologisms and paraphasias than their later stage counterparts.

Mentis, et al. (1995) engaged their subjects (twelve with moderate to severe DAT and twelve controls) in a twenty-minute, casual conversation. The subjects with DAT exhibited reduced ability to "change topic while preserving the discourse flow," (p. 1054) difficulty developing a topic to discuss, and failure to maintain the topic in a clear and coherent manner.

Ripich and Terrell (1988) conducted topic-centered interviews with six subjects diagnosed with DAT and six apparently normally aging subjects. Of the subjects with Alzheimer's disease, two were in the early stage, three were in the middle stage and one was in the late stage. They found that the subjects with DAT used significantly more words overall and more turns. Additionally, the interviewer used more words and turns when conversing with the subjects with DAT. Although the interviews were longer and more

interactive, they were judged to have less coherence due to the missing elements in the subjects' statements. The investigators concluded that "loss of ability to take the listener's perspective in developing thematic structure during conversation" contributed to this phenomenon. (p.14)

In their comparative study, Nicholas, Obler, Albert and Helm-Estabrooks (1985) showed that subjects with mild to moderately severe Alzheimer's produced more empty speech than subjects with Wernicke's or anomic aphasia (n = 4 per group). The main components of empty speech characterizing Alzheimer's included overuse of deictic terms (e.g., "this," "that," "those"), use of "and" excessively, and repetitions. The stimulus used in eliciting discourse was the Cookie Theft picture from the Boston Diagnostic Aphasia Examination, in which the subjects were requested to describe the events occurring in the picture.

Using a different approach, Heller, Dobbs and Rule (1992) showed their subjects a silent video cartoon, which they were requested to narrate as the events took place. Compared to the age- and education-matched controls, the subjects with Alzheimer's used fewer clauses during their descriptions and did not describe as many thematically-important events.

A comparative study was conducted by Bayles, Tomoeda, and Trosset (1992). In their research, they related the

subject's stage of Alzheimer's Disease (as determined by the Global Deterioration Scale) to the subject's communication abilities. Normal elderly subjects were used for controls. Numerous linguistic tasks were presented to the 236 subjects, with the two discourse tasks including Picture Description and Object Description. Language skills were measured by giving one point for each correct, nonredundant informational unit pertaining to the task. Subjects with mild Alzheimer's Disease (GDS rating of 3) scored 55% of the normal mean in discourse tasks. At GDS 4, 5, 6, and 7, the subjects scored less than 50% of the normal mean on discourse tasks. Additionally, the scores became progressively lower, reaching 0.0% at stage 7.

Ellis (1996) also conducted a comparative study, which investigated the differences between a total of thirteen subjects with mild and advanced Alzheimer's disease. The subjects were engaged in conversation in a naturalistic setting. This study showed that, in comparison to subjects with mild DAT, those with advanced DAT had difficulty maintaining the topic, used conjoined rather than embedded clauses, and demonstrated overuse of nonspecific deictics, empty speech, and elliptical sentence structure.

Tomoeda and Bayles (1993) conducted a longitudinal study which measured three subjects annually over five years. This study incorporated the use of three matched

normal-aging controls. All subjects were requested to describe the "Easter Morning" picture by Norman Rockwell. The study showed that the subjects with DAT exhibited an overall deterioration of semantic substance over time. Further, overall total number of words decreased over time. They reported that the most significant indicator of change over time was in the measurement of the number of informational units used. Further, they stated that the most effective differentiator between early DAT (GDS 3 and 4) and normal controls was the measure of conciseness, which is a ratio of number of informational units to number of words.

Hamilton (1994) conducted a longitudinal study that described the discourse changes of a single subject over the period of four and one-half years. During this time, the subject, who was institutionalized, declined from Stage Five on the Global Deterioration Scale to Stage Seven. The subject was engaged in active conversation of varying lengths (two to forty-one minutes) and at varying intervals between data collections (two days to seventeen months). There were fourteen conversations in all.

Hamilton reported that her subject had difficulty in "taking the role of the other" (p. 41) in conversations, which led to poor presupposition of knowledge known to the conversational partner, unclear antecedents, and

inappropriate topic shifts. This difficulty increased over time.

Increasingly egocentric speech was noted as well. For instance, two years into the study, the subject ceased to ask the examiner personal questions, but continued to ask questions to clarify information and to request the examiner to perform actions that would benefit the subject.

Additionally, Hamilton's subject, called Elsie, used empty speech (indefinite words, such as "things" or "stuff"), as well as reassigned meanings to words (e.g., consistently calling paintings "dresses").

The amount and type of questions produced by Elsie were investigated as well. Across measures, the greatest proportion of questions were those that could be answered with a response of "yes" or "no." Her productions of questions increasingly referred to proximal, as opposed to distal, objects. Elsie's discourse decreased in proportion of utterances that were questions as she progressed.

Regarding Elsie's response to questions, the proportion of inappropriate responses to questions remained the same over time, but the type of inappropriate response changed. Vague responses and grammatical mismatches were initially the prevalent type of error. Eventually, problematic responses shifted to question type mismatch, and later, to no response.

Overall, Hamilton breaks Elsie's discourse into four stages: active, confused and aware; active, confused and unaware; less active, confused and unaware; and passive. Although these stages do not directly correlate with GDS stages, the subject was initially at GDS Stage Five and progressed to Stage Seven.

Purpose of the Study

Many characteristics in the discourse of those with Alzheimer's Disease have been identified through research. Prominent among these are empty speech and decreased content units (Sabat, 1994). However, few studies have identified how discourse changes over time. Some have been cross-sectional (e.g., Fromm & Holland, 1989); others have studied overall changes in informational units (Bayles, et al., 1992). However, none have done in-depth studies of the characteristics of discourse patterns changing over time in a variety of discourse tasks. These are areas that this study addressed.

The purpose of this study was threefold. First, the study examined the changes of discourse patterns over the period of six months. Second, the subjects were given a variety of discourse tasks in order to ascertain their level of language functioning in activities with varying constraints and to determine if these tasks varied in their

sensitivity to change. Third, the characteristics of their discourse were compared with their level on the <u>Global Deterioration Scale</u>, to determine whether each stage had particular language patterns that distinguished it from the other stages.

CHAPTER II

METHODS

Subjects

Nine subjects participated in this study. All subjects
were diagnosed with Alzheimer's disease by a physician and
displayed dementia of the Alzheimer's type. Subjects with
other possible causes of dementia were excluded. Therefore,
at the onset of the study, subjects with a history of
traumatic brain injury, cerebral vascular accident, brain
surgery, clinical depression, cancer of the central nervous
system, periods of anoxia, seizure disorder or neurological
disease (e.g., Parkinson's disease, etc.) were excluded.

Additionally, no significant visual or auditory
discrimination problems were detected by informal testing.
Auditory discrimination was assessed using the Arizona
Battery of Communication in Dementia (ABCD), Speech
Discrimination Screening Task by Bayles and Tomoeda (1991).
Subjects were required to score 80% or better at the time of
initial testing. For visual perception screening, the
investigator showed each subject simple line drawings with

the name printed below, and the subjects were requested to name or read the name of each object. Subjects were required to have a score of 80% or better at the time of initial testing.

Two subjects were male and seven subjects were female, ranging in age from 64 to 88, with a mean of 81. Subjects were rated on the Global Deterioration Scale (Reisberg, Ferris, & Crook, 1982) (see Appendix C for a summary of characteristics of each stage), and ranged from Stages 3 to 6 for the initial measurement and Stages 4 through 7 for the final measurement. Two of the subjects only have data from one measurement.

Procedures and Analysis

A series of six language tasks was given to the subjects at each data collection session. Data were collected at the LIFE Center (an adult day services facility in Stillwater, Oklahoma) or the office of a Stillwater, Oklahoma, neurologist. The testing rooms were quiet and free from distractions. Data were collected on two occasions, approximately six months apart (range of 22 to 29 weeks). All language tasks were recorded using an audiotape recorder (Realistic CTR-73). The recordings were transcribed orthographically at a later time. Caregivers of each individual subject had the option of attending the

This analysis format was adapted by the researcher from procedures described by Hartley (1995).

The protocol examined the following problem areas of discourse (examples and/or explanations of each category follow their respective heading):

a. Message inaccuracy:
- Incorrect information
- If personal information stated earlier, information that the speaker later contradicts.
- A statement with: (a) an incorrect conclusion (e.g., "it says 12:00 so it must be noon," when it's actually midnight) or (b) faulty logic that draws a correct conclusion (e.g., "She's smiling, so she must be the mother").

b. Poor topic maintenance:
- Sudden topic shifts, even during a tangent. (i.e., when a subject veers from task, that first utterance is counted as poor topic maintenance. If the speaker subsequently changes from a vacation story to a career story, that leading sentence is also counted). So, each tangential topic shift is what is counted in this category, not each tangential statement (which are generally counted as irrelevant statements).

c. Inappropriate responses:
- A response to a statement that does not logically follow the previous utterance.

d. Insufficient information:
- Too much presupposition (i.e., the speaker mistakenly assumes the listener knows information, people, etc., of which the listener is not aware—e.g., family members, events that the listener did not attend, etc.)
- Listener is not provided enough information for a clear message.

e. Non-specific vocabulary:
- Words such as "things," "stuff," "those" (when no antecedent is mentioned previously), or phrases such as "do it" instead of "fasten it."

- Listener is unclear as to the specific intent of the message.

f. Informational redundancy:
- Same information is repeated, but not with the (apparent) intent of emphasis or elaboration (Example of elaboration: "We had an older house. We had an old, decrepit house that was falling down." This would be appropriate because it provides additional information. Example of redundancy: "The clock says 12:00 so it must be noon." When the subject later says, "And it's noon," that would be classified as informational redundancy.)
- Not including information that is repeated when it is relevant to the context. (e.g., First subject stated that she never had any brothers. When examiner later makes statement about her own brother, subject states, "I'm glad that you had a brother, because I never did." This is not counted as redundant, because it explains the first part of the sentence.)

g. Linguistic nonfluency:
- Typical stuttering behavior.
- Repetitions.
- More than 2 revisions per T-unit or more than 2 filled pauses (um, uh, etc.) per T-unit.
- Pauses longer than 4 seconds, or more than 3 pauses per T-unit.

h. Revision
- Changing sentence midstream, usually for effect of accuracy or clarity.
- In a set of two T-units, the second revises the first (e.g., "The aunt, uncle, brother is sleeping. No, it's a dad.")

i. Unclear reference:
- Listener is unclear as to who the speaker refers to, exactly what was done, where, etc.
- Message is lacking a subject, verb, object, etc. that is necessary for clarity.

j. Errors in pronoun use:
- For example, calling a male "she," etc.
- NOT including calling an animal "it" unless the gender is clear.

k. Naming errors
- Calling an object, action, etc. by the wrong word. NOT including words that are not specific enough or words that are not known in the English language.
- NOT including wrong conjunction choice or wrong form of word (e.g., past tense for present).

l. Irrelevant statements:
- Statements that do not have a connection to the topic at hand.
- During *conversations*, this does not include sudden topic shifts (poor topic maintenance).
- During topic-specific tasks (e.g., story generation) this includes statements not related to the task.

m. Personal experience/evaluation
- Statements that tell of personal experience when not necessary.
- Statements that may somehow be related to the topic, but are not necessarily formulated to add to the specific topic at hand (e.g., "That little boy looks like my grandson.")
- Personal opinion of something, such as "I love football" when the task doesn't directly call for it (such as story generation).
- Not included on the unstructured conversation task, where personal experience and opinion is often acceptable.
- Does not include explanations of answers (For instance, in describing taking a trip, the subject might say, "I would eat lunch because I like to have a full stomach on a trip." This is acceptable for the procedural explanation task. However, this statement would be categorized as both irrelevant *and* personal experience/evaluation for a story generation task.)
- Information that is inferred from a picture, etc. that may not necessarily be true.

n. Excessive detail:
- Going into minute detail.
- Providing more information than is necessary.

o. Neologisms:
* Apparently invented words.

p. Abandoned thoughts:
* Sentences neither completed nor revised.

For each subject, the number of utterances that fit into each category was determined. Additionally, the percentage of problem behaviors for which each category accounted was calculated.

2. Story Retelling Task: Subjects were read "The Lost Wallet Story" from The Arizona Battery for Communication in Dementia (Bayles & Tomoeda, 1991) and asked to retell the story immediately. The stories were then scored by counting the number of informational units included in the retelling, according to the standardized procedures set forth in the ABCD.

3. Video Narration/Summary Task: Subjects were shown a fifteen-minute silent video (Frog Goes to Dinner, Phoenix/BFA Films) and asked to provide a narrative of the events in the film as they were watching it. After the film, they were asked to provide a summary of the film's events. The narration (during the viewing of the video) was scored for main content units (the number of correct, nonredundant facts mentioned—see Appendix B for list of possible content units). The retelling was scored for content units, use of cohesive markers (first, then, etc.) and reasonably correct order of events. Both of the

language samples were then scored using the

"Quantitative/Qualitative Discourse Analysis Protocol."

4. Conversation Task: Subjects were engaged in conversation

by the examiner through a series of open-ended questions

(e.g., "Tell me about your family."). Subjects' spouses

occasionally participated as well, in a limited capacity.

This conversation was scored using the

"Quantitative/Qualitative Discourse Analysis Protocol."

5. Procedural Explanation: Subjects were asked to relate the

steps involved in two common procedures (the examiner

selected two from the following: getting ready in the

morning, going to bed at night, preparing for a trip, or

preparing to go to a doctor's appointment). Their language

samples were analyzed using the "Quantitative/Qualitative

Discourse Analysis Protocol." Additionally, the number of

content units was tallied.

6. Story Generation Task: Subjects were shown three color

pictures similar to Norman Rockwell illustrations which

contained subtle events (e.g., man leaving stadium in

disgust when his team is losing, as indicated by his attire

and the scoreboard). They were asked to tell a story about

each picture. Each story was rated according to the number

of informational units in the following categories: setting

(environment, main characters, etc.), events (what is

occurring in the picture), and gist (the main points or

essence of the picture) (see Appendix B for a complete list of possible content units). The stories were also analyzed using the "Quantitative/Qualitative Discourse Analysis Protocol."

Additionally, each subject was rated on Ehrlich and Barry's Conversational Rating Scale outlined in "Rating Communication Behaviours in the Head-Injured Adult" (1989). The categories analyzed were Overall Intelligibility, Syntax, Coherence of Narrative, Topic Maintenance, and Initiation of Communication (see Appendix B for a copy of this scale). This rating was based on total performance on each testing date.

The Picture Description and Story Generation tasks were chosen to examine the number of content units produced when the subject was given a visual stimulus to discuss. The pictures provided a concrete frame of reference, allowing the examiner to ascertain the intended message, even when the verbal message was unclear. The two tasks differed in that the stimulus in the Picture Description task was a simple line drawing, while the stimuli in the story generation task were full-color and more detailed. Thus, the Story Generation task produced a greater processing load on the subject due to the greater detail in the drawings and the subject being required to filter extraneous information presented pictorially. Further, the Story Generation

stimuli had more subtle events, allowing for interpretation of the subject's ability to draw conclusions about the gist of the picture.

The Video Narration portion of the Video Narration/Retelling task encouraged the subject to concentrate more fully on the stimulus being presented. Further, through the measurement of content units, it gave an indication of the subject's ability to discern the main events that occurred. The Retelling portion of the Video task examined the effect of increased memory load on discourse. It also measured the ability to recall relevant events that were recently presented visually.

The Story Retelling task was a measure of the subject's ability to recall information recently presented verbally. It differed from the Video Retelling by providing more structure, auditory (versus visual) stimulus, and a shorter story to be recalled. Additionally, the subjects were told specifically the desired content units to remember, so there was no need to filter extraneous information.

The Procedural Explanation task required sequencing and problem solving. Further, it was more abstract in that it required the subject to draw from past experience, create generalities, and discuss events temporally separated from the testing situation.

The unstructured Conversation was the most naturalistic of the tasks presented. It gave the most information about the subject's pragmatic skills and allowed the subject to have more control over the task. However, because it was an unstructured task, it provided new areas of discourse difficulty, in that the task inherently had less predictability.

Reliability

In order to ensure interjudge reliability of measures, the researcher, a speech-language pathologist, and a graduate student in speech-language pathology rated a set of language samples for one subject and compared ratings. Differences were resolved and further definitions of criteria were developed as necessary. After criteria were modified, the researcher scored all language measures. Each subject also had two of the language tasks (randomly chosen) scored by a graduate student in speech-language pathology. Pearson Product-Moment Correlation was performed on the raters' percentages of problem utterances for each task ($n = 18$) and the correlation coefficient was calculated as .714 ($p = .001$).

Additionally, transcription reliability was ascertained by use of two randomly chosen audiotapes (12.5% of data collection samples). Interjudge reliability was found to be

94% agreement for one tape and 97% for the other tape, with an overall agreement of 95% for subject utterances.

For each data collection, subjects were rated according to the Global Deterioration Scale by the researcher. Sixty percent of subjects were also rated according to the Global Deterioration Scale by two staff members at the LIFE Center to establish reliability of this measure. These staff members were familiar with the subjects and interacted with them on a regular basis. However, it should be noted that the Global Deterioration Scale is a subjective measure without quantifiable data. The percentage of agreement was 80%, with at least one rater agreeing with each GDS rating assigned by the examiner.

Reliability of the division of T-units was established by having a graduate student in speech-language pathology determine T-units for 12.5% of the data collection samples. Percentage of agreement was 97%.

CHAPTER III

RESULTS

Two sets of data, approximately six months apart, were available for seven of the nine subjects. The remaining subjects had one set of data.

Of the subjects with two sets of data, each had the following information available:

- Two GDS ratings

- Two ratings on the Conversational Rating Scale

- Two scores on the Story Retelling task

- Two sets of scores for content units on each of the following tasks:

  - Picture Description

  - Video Narration/Summary

  - Procedural Explanation

  - Story Generation

- Two sets of measures (16) on the "Quantitative/Qualitative Analysis Protocol" for each of the following tasks:

  - Picture Description

  - Video Narration/Summary

- Conversation

- Procedural Explanation

- Story Generation

- Two measures of Cohesive Markers from the Video Retelling task

- Two measures of Correct Sequencing from the Video Retelling task

Table 1 shows Conversational Rating Scale scores, grouped by Global Deterioration Scale ratings. Comparison of problem behaviors for each discourse task, with reference to Global Deterioration Scale ratings, is shown in Tables 2-9. (See Tables 10-18 in Appendix D for a comparison of problem behaviors for individual subjects across all discourse tasks rated by the "Quantitative/Qualitative Analysis Protocol." Also, see Tables 19-24 in Appendix D for raw data for each task). The percentages shown represent the proportion of problem utterances, as opposed to the percentage of total utterances.

Table 25 in Appendix D shows problem behaviors for the Story Generation task computed by using a different method (number of utterances with a specific type of problem behavior divided by total utterances). This was compared to data in Table 6 (number of utterances with a specific type of problem behavior divided by total number of utterances

Table 1
Comparison of Conversational Rating Scale Scores by Global Deterioration Scale Rating

	Subject	INT	SYN	COH	TM	INI
Stage 3	2-1	9	9	8	8	9
Stage 4	4-1	9	7	8	8	9
	1-1	9	7	7	8	9
	2-2	9	5	7	7	8
Stage 5	3-1	7	6	5	3	7
	6-1	9	6	6	7	9
	9-1	9	3	3	2	6
	4-2	9	5	7	8	8
	3-2	7	3	5	3	7
	1-2	9	7	6	7	9
Stage 6	9-2	9	5	3	2	6
	5-1	9	4	5	2	8
	8-1	9	5	4	2	9
	5-2	9	3	4	2	6
	6-2	8	3	3	4	6
Stage 7	7-2	5	1	1	1	2

Subjects are listed by their subject number, followed by the measure number.
INT = intelligibility. SYN = syntax. COH = coherence.
TM = topic maintenance. INI = initiation.

Table 2
Comparison of Story Retelling Units by Global Deterioration Stage

Stage	3	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7
Subject	2-1	4-1	1-1	2-2	3-1	6-1	9-1	4-2	3-2	1-2	9-2	5-1	8-1	5-2	6-2	7-2
Units	8	13	3	12	10	3	0	12	12	6	0	0	5	0	6	0
% Correct	57	93	21	86	71	21	0	86	86	43	0	0	36	0	43	0

Table 3

Comparison of Problem Behaviors for Conversation

Behavior	Stage 3 Subject 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts		13%	24%		8%	13%	2%	18%	4%	11%	5%	6%	3%		7%	
Errors in Pronoun Use					2%		2%									
Excessive Detail																
Inappropriate Responses		13%	4%			4%	4%	9%		7%	3%	6%	3%			13%
Informational Redundancy	17%		12%	19%	6%	4%	8%		15%	4%		6%		8%		
Insufficient Information			8%				2%			4%			11%			
Irrelevant Statements										4%						
Linguistic Nonfluency	83%	26%	16%	30%	29%	17%	8%	18%	17%	7%	13%	6%	9%	4%	27%	
Message Inaccuracy					2%		8%	18%				19%	9%			13%
Naming Errors							2%		2%			6%				
Neologisms					4%						5%	6%		8%		
Nonspecific Vocabulary				4%		9%	12%			11%	23%	31%	11%	13%		13%
Personal Experience/Evaluation																
Poor Topic Maintenance		9%			16%					11%	8%				13%	
Revision		22%	24%	26%	8%	9%	15%	18%	7%	11%	8%		3%	8%	27%	
Unclear Reference		17%	4%	22%	27%	39%	38%	18%	54%	32%	36%	13%	51%	58%	27%	63%
Total Utterances	41	61	94	82	80	63	88	40	64	60	35	54	57	47	51	21
Total Problem Behaviors	6	23	25	27	51	23	52	11	46	28	39	16	35	24	15	8
Utterances w/ Problem Behavior	6	19	20	23	42	22	42	9	34	21	23	13	33	21	14	8
% Utterances w/ Problem Behavior	15%	31%	21%	28%	53%	35%	48%	23%	74%	35%	66%	24%	58%	45%	27%	38%

Note: Percentages shown represent the percentage of total discourse problems.
In each column heading, the first number is the number of the subject, the second number is the number of the measure.

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Table 4

Comparison of Problem Behaviors for Picture Description

Behavior	Stage Subject	3 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1*	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts						2%		18%		1%		4%			8%	20%	
Errors in Pronoun Use					8%			12%		<1%							
Excessive Detail																	
Inappropriate Responses																	
Informational Redundancy		22%	50%	20%	8%	8%				1%	17%						
Insufficient Information																	
Irrelevant Statements		6%				24%				39%							
Linguistic Nonfluency		6%				4%				7%	17%	4%			15%		
Message Inaccuracy				40%				12%		<1%	17%	8%		40%	15%		13%
Naming Errors						2%											
Neologisms												17%		40%	15%		25%
Nonspecific Vocabulary		6%				2%		24%		<1%							
Personal Experience/Evaluation		33%	50%	20%	69%	22%	60%			39%		25%			8%		
Poor Topic Maintenance										2%							
Revision		6%			8%	4%	40%			3%	17%					80%	
Unclear Reference		22%		20%	8%	32%		35%		7%	33%	42%		20%	38%		63%
Total Utterances		24	8	9	23	44	14	13	5	122	13	20		6	18	9	6
Total Problem Behaviors		18	2	5	13	50	5	17	0	284	6	24		5	13	5	8
Utterances w/ Problem Behavior		15	2	5	12	28	5	9	0	116	4	15		3	10	5	6
% Utterances w/ Problem Behavior		63%	25%	56%	52%	70%	36%	69%	0%	95%	31%	75%		50%	56%	56%	100%
Content Units (12 possible)		9	7	7	10	10	8	5	7	5	8	5		4	3	1	2
Setting (4 possible)		3	3	3	3	3	3	3	3	3	3	3		2	3	0	2
Events (6 possible)		4	4	3	5	5	4	2	3	2	4	2		2	0	1	0
Gist (2 possible)		2	0	1	2	2	1	0	1	0	1	0		0	0	0	0

Note: Percentages shown represent the percentage of total discourse problems.
In each column heading, the first number is the number of the subject, the second number is the number of the measure. * = No data are available for this subject on this task.

Table 5

Comparison of Problem Behaviors for Procedural Explanation

Behavior	Stage Subject	3 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts			6%	14%		2%			8%		10%		33%				
Errors in Pronoun Use		7%															
Excessive Detail								5%									
Inappropriate Responses																	
Informational Redundancy		36%				1%	29%				10%					50%	
Insufficient Information		7%															
Irrelevant Statements			47%		33%	27%		3%	31%	51%	5%				27%		
Linguistic Nonfluency		43%	3%	14%	11%	18%		8%	8%	27%	5%				11%		
Message Inaccuracy						1%	14%	8%			30%			9%	11%	50%	
Naming Errors						2%											
Neologisms									8%			29%	33%	9%	11%		
Nonspecific Vocabulary			6%			1%	58%	22%			5%	29%		9%			
Personal Experience/Evaluation		7%	3%		56%	24%		3%	31%					27%			
Poor Topic Maintenance						2%				10%							
Revision			6%	71%		2%		5%	8%		5%		11%				
Total Utterances		21	32	16	7	54	21	29	15	45	23	8	24	18	21	6	4
Unclear Reference			28%			19%		46%	15%	7%	30%	43%	22%	18%	67%		100%
Total Problem Behaviors		14	32	7	9	85	7	37	13	30	20	7	9	11	9	2	1
Utterances w/ Problem Behavior		13	22	5	5	40	6	19	8	24	11	5	7	7	8	2	1
% Utterances w/ Problem Behavior		62%	69%	31%	71%	75%	29%	66%	53%	67%	48%	63%	29%	39%	38%	33%	25%
Content Units		6	5	4	7	7	4	6	5	7	7	3	4	4	0	2	3

Note: Percentages shown represent the percentage of total discourse problems.
In each column heading, the first number is the number of the subject, the second number is the number of the measure.

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Table 6

Comparison of Problem Behaviors for Story Generation

Behavior	Stage 3 Subject 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1 *	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts		13%	3%		4%			5%	2%	8%			4%		17%	
Errors in Pronoun Use									1%							
Excessive Detail								14%								
Inappropriate Responses						14%	4%									6%
Informational Redundancy	6%		9%	17%	4%			5%	5%	19%	5%		4%	9%	6%	
Insufficient Information	6%		13%		2%								4%			
Irrelevant Statements	6%				25%	14%	4%		28%							
Linguistic Nonfluency	22%	19%	22%		21%	7%		5%	12%	4%	12%		9%	4%		
Message Inaccuracy	22%	25%	19%	22%	8%	14%	24%	29%	6%	38%	19%		9%	40%	28%	60%
Naming Errors						7%	12%	5%						9%		
Neologisms						7%	4%				16%		4%	9%		
Nonspecific Vocabulary			6%	6%	<1%						9%		9%			20%
Personal Experience/Evaluation	33%		9%	33%	29%	29%	20%	14%	34%	12%	7%		22%	4%		
Poor Topic Maintenance					1%				2%							
Revision		31%	9%	17%	<1%		12%	10%	4%	12%				4%	6%	
Unclear Reference	6%	13%	9%	6%	6%	7%	20%	14%	5%	8%	33%		35%	22%	39%	20%
Total Utterances	30	26	36	25	135	20	24	26	186	27	28		20	26	25	9
Total Problem Behaviors	18	16	32	18	185	14	25	21	211	26	43		23	23	18	5
Utterances w/ Problem Behavior	16	11	23	15	101	13	17	15	113	19	22		17	16	15	5
% Utterances w/ Problem Behavior	53%	42%	64%	60%	75%	65%	71%	58%	61%	70%	79%		85%	62%	60%	56%
Content Units (33 possible)	17	18	17	16	7	6	7	20	17	13	5		8	3	8	1
Setting (15 possible)	8	9	8	5	6	4	4	12	9	7	3		5	2	5	1
Events (10 possible)	5	5	5	6	1	2	3	3	4	5	1		2	0	3	0
Gist (8 possible)	4	4	4	5	0	0	0	5	4	1	1		1	1	0	0

Note: Percentages shown represent the percentage of total discourse problems.
In each column heading, the first number is the number of the subject; the second number is the number of the measure. * = no data were available for this subject on this task

Table 7
Comparison of Problem Behaviors for Video Narration

Behavior	Stage Subject	3 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts		5%	7%	43%	3%	69%	23%	6%	21%	16%	9%		20%	4%	25%	20%	14%
Errors in Pronoun Use					3%										13%		
Excessive Detail			7%														
Inappropriate Responses								6%									
Informational Redundancy					6%	4%								1%			
Insufficient Information							15%							3%			
Irrelevant Statements						26%	8%			23%				22%			
Linguistic Nonfluency		38%	13%	14%	6%	4%	8%	6%	5%			8%	20%				
Message Inaccuracy		5%	7%	29%	3%	1%	8%	18%	11%	6%	5%	8%	20%	8%	25%	40%	57%
Naming Errors			7%						5%					3%			
Neologisms								12%						1%	38%		
Nonspecific Vocabulary					6%			6%					15%	3%			
Personal Experience/Evaluation		16%	20%		13%	52%	15%	12%	21%	39%	64%	23%	40%	24%		20%	
Poor Topic Maintenance														5%			
Revision		16%	33%	14%	13%	4%			32%	6%	14%			1%			
Unclear Reference		19%	13%		16%	1%	23%	35%	11%	10%	9%	70%		25%		20%	29%
Total Utterances		80	56	20	87	114	38	28	49	63	50	15	31	114	32	8	12
Total Problem Behaviors		37	15	7	31	96	13	17	19	31	22	13	5	76	8	5	7
Utterances w/ Problem Behavior		33	10	6	25	58	13	12	16	19	19	11	5	51	7	5	7
% Utterances w/ Problem Behavior		41%	18%	30%	29%	51%	34%	43%	33%	30%	38%	73%	16%	45%	22%	63%	58%
Content Units (15 possible)		15	14	4	14	8	4	2	13	4	5*	2	4	5	13	1	1

Note: Percentages shown represent the percentage of total discourse problems.
In each column heading, the first number is the number of the subject, the second number is the number of the measure. * = A portion of this task failed to record. The subject narrated 50% of the content units that had been viewed, until the time of the recording failure.

Table 8
Comparison of Problem Behaviors for Video Retelling

Behavior	Stage Subject	3 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2 *	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts			18%	25%												9%	
Errors in Pronoun Use			9%														
Excessive Detail																	
Inappropriate Responses																	
Informational Redundancy		20%				2%							40%				
Insufficient Information																	
Irrelevant Statements			9%			13%								17%			
Linguistic Nonfluency		40%	9%			21%	13%		33%		14%	5%				9%	
Message Inaccuracy		30%			100%	4%	38%	46%			14%	25%	30%	13%	33%	9%	
Naming Errors						2%											
Neologisms							13%					15%			33%		
Nonspecific Vocabulary				25%				8%				5%	10%	4%			
Personal Experience/Evaluation				25%		53%	13%				29%	5%		17%			
Poor Topic Maintenance														8%		9%	
Revision			37%	25%							14%	5%			17%	9%	
Unclear Reference		10%	18%			4%	25%	46%	67%		29%	40%	20%	42%	17%	55%	
Total Utterances		18	21	7	6	36	14	10	9		11	9	21	38	12	10	2
Total Problem Behaviors		10	11	4	2	47	8	13	3		7	20	10	24	6	11	0
Utterances w/ Problem Behavior		6	11	3	2	32	5	6	3		7	9	9	19	48	8	0
% Utterances w/ Problem Behavior		33%	48	43%	33%	89%	36%	60%	33%		64%	100%	43%	50%	33%	80%	0%
Content Units (15 possible)		6	10	2	3	4	1	1	6		4	1	0	2	0	2	0
Cohesive Markers		7	17	2	5	6	3	2	9		6	7	4	5	1	0	0
Correct Order		yes	yes	yes	yes	yes	-	-	yes		yes	-	-	no	-	yes	-

Note: Percentages shown represent the percentage of total discourse problems.
In each column heading, the first number is the number of the subject, the second number is the number of
the measure. * = no data exist for this subject on this task.

with problem behaviors). Upon comparison, both methods of analysis result in the same four problem behaviors as being most prevalent for their respective GDS stages. Additionally, results for individual subjects indicate the same main discourse characteristics with either computation method.

Commonalities

For subjects with two GDS ratings available, the majority (five of seven) fell one level in the six month interval between testing sessions. Two (one at Stage Five and one at Stage Six) remained at the same level, although both had higher percentages of problem behaviors during the second testing session. Discourse problem behaviors that were common across the majority of subjects included unclear reference, message inaccuracy, abandoned thoughts, personal experience/evaluation, revision, and irrelevant statements. Additionally, nonfluencies occurred among all subjects, although generally as a small proportion of all discourse problems.

Overall, during measure two, subjects tended to continue to exhibit the same main discourse problems. These problems tended to worsen with time. Additionally, many acquired additional discourse problems, particularly

neologisms.   Further, all subjects except Subjects One and Nine decreased in their syntax ratings on the Conversational Rating Scale.   Coherence also decreased for all but two subjects, who maintained their ratings.

Subjects showed an overall increase in the total number of problem behaviors.   There were some percentage shifts in the types of behaviors that were predominant (i.e., the type of behavior that was most common in measure one was not necessarily the most common in measure two).

As a whole, all subjects had a high percentage of problem behaviors on the Story Generation task (range 42-85%, average 64%).   In general, there was the least proportion of problem behaviors in the Video Narration task (range 16-73%, average 39%).

Task Measurements' Sensitivity to Change

Content Units

There were a number of task measurements that were sensitive to change across Global Deterioration Scale ratings.   Particularly, the majority of tasks that measured content units showed differences among the various ratings. Video Narration showed an overall decrease in the number of content units by stage.   However, there was an overlap of

scores among the ratings, especially between Stages Five and Six.

Story Generation showed an overall decrease in total content units by GDS rating. This was especially apparent in the category of "gist." At Stages Three and Four, all subjects related between four and five content units in the category of gist. At Stage Five, four of the six subjects scored one or zero in the gist category. At Stage Six, all of the subjects evaluated had scores of zero or one in the category of gist. At Stage Seven, the subject had a score of zero for gist, and only one point (out of thirty-three possible) for total content units.

Picture Description had a decrease in the average number of total content units with each progressive stage (Stage 3 had an average of 9 content units, Stage 4 had an average of 8 content units, Stage 5 had an average of 7.2 content units, Stage 6 had an average of 3.25 content units, and Stage 7 had an average of 2 content units). However, Stages Three through Five had an overlap of scores for total content units, as did Stages Six and Seven. There was especially an overall decline in content units in the category of "events." Additionally, a portion of subjects at Stages Four and Five related no content units that were classified as gist, and none of the subjects at Stages Six and Seven related content units in the gist category (see

Table 9 for mean and range of content units for each GDS

stage).

Table 9
Number of Content Units Related in Picture Description Task

Content Units	Maximum Number	Stage Three		Stage Four		Stage Five		Stage Six		Stage Seven	
		M	R	M	R	M	R	M	R	M	R
Total	12	9.0	9-9	8.0	7-10	7.2	5-10	3.25	1-5	2.0	2-2
Setting	4	3.0	3-3	3.0	3-3	3.0	3-3	2.0	0-3	2.0	2-2
Events	6	4.0	4-4	4.0	3-5	3.3	2-5	1.25	0-2	0.0	0-0
Gist	2	2.0	2-2	1.0	0-2	0.8	0-2	0.0	0-0	0.0	0-0

M = Mean; R = Range

Video Retelling did not have the same trend of
decreasing number of content units between each stage. Among
Stages Three through Five, the numbers were varied within
each stage. However, Stages Six and Seven showed a definite
difference from the less severe stages. At Stage Six, the
scores ranged from zero to two (out of fifteen content
units). And at Stage Seven, the subject related no content
units and could not relate the main character of the movie
upon direct questioning.

A similar result was observed in the Procedural
Explanation task. Subjects at Stages Three through Five had
similar numbers of content units (range of four to seven
content units, with an average of 5.8 units). However, at
Stage Six, the range dropped to zero to four, with an
average of 2.6 content units. The subject at Stage Seven
had similar results, with a total of three content units.

Problem Behaviors

With respect to percentage of utterances with problem behaviors, all tasks except the Procedural Explanation task had a general trend of having an increase in the average percentage of problem behaviors in Stages Three through Six. However, the range of scores for each stage was too great to show a consistent pattern. The subject in Stage Seven occasionally had a lower percentage of problem behaviors than the subjects in Stage Six. This may be attributable to the decreased verbal output of this subject (a range of two to twenty-one utterances per task, with an average of eleven utterances). The utterances that were produced were mainly labeling ("That's a man"), questions to clarify statements made by others ("What was that?"), or agreement ("Yes"). Questions and statements of agreement have very few possible problem behaviors according to the analysis protocol used, but add little information to the task.

Conversational Rating Scale

The Conversational Rating Scale showed an overall decrease in syntax and coherence ratings with stage, although the ratings overlapped somewhat. Topic maintenance scores were varied for Stages Three through Five, but at Stages Six and Seven, they were consistently low. Initiation scores were consistently high for Stages Three and Four but were varied for Stages Five and Six. The

subject at Stage Seven scored low in this category, primarily for scant verbal output of any type (initiative or responsive). Intelligibility scores were similar for the majority of subjects at Stages Three through Six (with a mean of 8.7, range of 7 to 9, and mode of 9). However, the subject at Stage Seven scored five in this category.

Characteristics of Each GDS Stage

In each stage of the Global Deterioration Scale, there were certain characteristics that subjects had in common.

Because there was only one subject at Stage Three, strong conclusions cannot be drawn concerning the characteristics of others in this stage. This subject's discourse was marked by informational redundancy, linguistic nonfluency, and personal experience/evaluation. The subject's syntax was judged to be good, having varying sentence patterns and all necessary elements of the sentence. The subject was able to provide a relatively large amount of information, as noted by the high number of content units utilized. Additionally, the information relayed was presented in a coherent manner, with a clear message evident. The subject did have a reduced number of informational units in the immediate retelling of the "Lost

Wallet Story" (Story Retelling task), indicating some memory loss.

The discourse of those in Stage Four was strongly characterized by revision. In all but one task, subjects at this stage exhibited a higher proportion of errors classified as revision than subjects at all other stages. Additionally, nonfluencies and abandoned thoughts accounted for a high proportion of errors in subjects at this stage. Personal experience/evaluation was noted inconsistently across tasks. Subjects conveyed a relatively large amount of information in their discourse, as evidenced by the number of content units. Syntactic abilities were somewhat reduced, while coherence and topic maintenance were judged to be fairly high (range of scores was seven to eight for each category).

Subjects at Stage Five exhibited the highest proportion of personal experience/evaluation of all stages. Unclear references were much more common than in previous stages. Additional characteristics of discourse included message inaccuracy, abandoned thoughts and irrelevant statements. At this stage, half of the subjects exhibited topic maintenance problems according to the Conversational Rating Scale. Additionally, subjects' coherence was decreased in comparison to the discourse of those in previous stages.

At Stage Six, subjects began to exhibit a greater number of problems. Neologisms became much more common than in earlier stages. Unclear references and message inaccuracy were the prevailing characteristics as the intended message became less clear. At times, even the topic of subjects' discourse was difficult to discern. Topic maintenance was judged to be poor in all subjects (range of scores on the Conversational Rating Scale for topic maintenance was two to four, with a mode of four and an average of 2.4).

There was only one subject at Stage Seven. This subject's verbal output was greatly reduced. The main characteristics of discourse were unclear reference and message inaccuracy. At times, this subject appeared to be having a conversation separate from the one the examiner was conducting. Additionally, there was little content to the subject's discourse. For example, when the subject was asked what was involved at a previous job, the response was, "Well, first I was sixty-nine, and then I three or four. Then I helped drive my tractor…"

Characteristics of Individual Subjects

The subjects as individuals had results that varied somewhat from the overall characteristics of their respective GDS ratings. A subject was considered to have a

particular problem behavior as a major characteristic of his or her discourse if: (a) the behavior was present in four or more tasks or (b) if the behavior accounted for more than twenty-five percent of all problem behaviors on two or more tasks.

Subject One was at GDS Stage Four at initial testing, and progressed to Stage Five at final testing. The subject's discourse initially was marked by message inaccuracy, nonfluencies, revisions, and abandoned thoughts. For measure two, poor topic maintenance became an additional problem, although only during the unstructured Conversation task. Additionally, unclear references increased across the majority of tasks, while there was a decrease in revisions. This could indicate that the subject's self-monitoring skills were diminishing, as the subject became less able to compensate for communication difficulties associated with dementia. Further discourse characteristics included informational redundancy, message inaccuracy, and abandoned thoughts. The subject also presented with increased difficulty interpreting the gist of the pictures in the Story Generation task, decreasing from four points to one point (out of a possible eight). Additionally, the percentage of utterances with discourse problems increased across all tasks except Picture Description.

At initial testing, Subject Two was judged to be at Stage Three on the Global Deterioration Scale. By final testing, the subject had progressed to Stage Four. The subject's discourse initially had varying errors across the tasks. Linguistic nonfluency accounted for a high percentage of problem behaviors across all tasks. Also, informational redundancy, unclear reference, and personal experience/evaluation occurred across four or more tasks. Additionally, there was a high percentage of message inaccuracies in three of the six discourse tasks analyzed by the "Qualitative/Quantitative Analysis Protocol."

During the second measure, syntax use decreased from an initial rating of nine, to a final rating of five. Disfluencies had decreased dramatically across the majority of tasks, but remained high during unstructured conversation (30% of all errors, with 10% of all utterances containing disfluencies). Personal experience/evaluation was the most dramatic increase and became the problem behavior that prevailed for all tasks except Video Retelling (which had 33% of information classified as inaccurate) and Conversation (which does not include personal experience/evaluation as a possible error). Additional discourse characteristics to note include informational redundancy, revision, and unclear reference.

Memory tasks had varying results. Immediate recall of the Lost Wallet story increased from eight to twelve units (fourteen units possible), while recall of events in the silent video decreased from six to three units (fifteen units possible).

Subject Three was classified as Stage Five in both initial and final measures. This subject had numerous errors (up to 2.3 problem behaviors per T-unit) in the majority of categories across the majority of tasks, with the exception of no inappropriate responses, excessive detail, or neologisms noted throughout all discourse tasks. Initially, discourse problem behaviors included informational redundancy, message inaccuracy, linguistic nonfluency, revision, unclear reference, irrelevant statements, personal experience/evaluation, and abandoned thoughts. In the final measure, the characteristics of discourse included linguistic nonfluency, unclear reference, irrelevant statements, personal experience/evaluation, and abandoned thoughts.

The majority of errors were irrelevant statements and personal experience/evaluation. This was true across both initial and final measurements. Additionally, unclear references occurred across all tasks, accounting for as much as 54% of the errors in a particular task. The subject's overall discourse was marked with poor coherence and topic

maintenance. The main change between measures one and two was in the area of syntax. It was rated six initially, but fell to three in the final measure, primarily because of decreased use of articles, decreased subject-verb agreement, and decreased variety of sentence forms.

Performance increased in the amount of information relayed in the Story Generation task, as measured by content units. The subject initially presented seven content units, which increased to seventeen for the final measurement (possible of thirty-three). The number of content units increased for setting, events and gist. However, for the Picture Description task, the setting units remained the same (three of a possible four), event content units dropped from five to two (possible six) and gist units fell from two to zero (possible two).

Subject Four was initially classified as GDS Stage Four and progressed to Stage Five for the final measurement. The majority of this subject's errors were classified as linguistic nonfluency, revision, unclear reference and abandoned thoughts. This was consistent across initial and final measurements. The subject had the additional pattern of having a high proportion of irrelevant statements on the Procedural Explanation task for both measures, but only one other instance in all the other tasks, which was Video Retelling in measure one.

Overall, discourse changes were marked by decrease in syntax (from a rating of seven to a rating of five) and decreased verbal output (as measured by number of T-units per task). This subject is the only one who was rated as having good topic maintenance initially, and did not decline for the final measurement (a score of eight on a scale of one through nine).

Subject Five was classified as GDS Stage Six for both initial and final measures. This subject did not have measurements for Story Generation or Picture Description tasks for measure one due to unavailability of materials. For the remaining tasks, verbal output decreased (as measured by overall number of T-units) while percentage of utterances with errors increased. Since only four of the six tasks were measured initially, none of the discourse problem behaviors met the criteria of becoming a main problem behavior. However, the majority of problem behaviors were message inaccuracy, neologisms, and unclear reference. This pattern of discourse continued and worsened for measure two. Additionally, nonfluencies became an increased problem.

Despite the number of utterances used, the subject conveyed little information in discourse, as evidenced by the low number of content units for Picture Description (3/12 content units, using 18 utterances), and Story

Generation (3/33 units using 26 utterances). Additionally, the subject used 31 (measure one) and 32 (measure two) utterances to convey four (27%) and two (13%) content units for the Video Narration task. Even more notable is that the subject did not convey any information listed as possible content units for the Video Retelling task, but used twenty-one utterances for measure one, and twelve utterances for measure two (the information relayed was largely confabulatatory, unclear in reference, and redundant). Additionally, it should be noted that no content units were recalled for the Story Retelling task on either measure.

During all description tasks (Story Generation, Picture Description, and Video Narration), the subject appeared to have difficulty interpreting the visual stimulus, asking questions such as "What's he doing?" during the video.

Subject Six was rated as being at Stage Five initially, and progressed to Stage Six for the second measurement. Initial discourse was characterized by personal experience/evaluation, unclear reference, occasional nonfluency, and message inaccuracy. Overall, message inaccuracy and unclear reference increased, and additional traits of revision and abandoned thoughts were noted. Topic maintenance difficulties, informational redundancy, abandoned thoughts, and revision increased greatly during the second measure. Syntax, coherence, topic maintenance,

and initiation of conversation all decreased by three ratings. Utterances became telegraphic in nature, with few details and increased labeling. Overall verbal output decreased (as evidenced by number of utterances per task) while overall percentage of utterances containing errors increased.

The number of information units decreased in the Picture Description task (from 8 to 1 out of 12 possible content units) and Video Narration (from 4 to 1 out of 15 possible content units). However, it increased in the Story Generation task (from 6 to 8 out of 33 possible content units) and Video Retelling task (from 1 to 2 content units out of 15 possible). It should be noted that the subject was unable to produce any content units relating the gist of the pictures for either Picture Description or Story Generation tasks.

Due to researcher error, Subject Seven has data on measure two only. This subject was rated as Stage Seven at measure two. This was the only subject that had a low score for intelligibility (5 on the Conversational Rating Scale, with the majority of subjects rating 9 for both measures). Additionally, the subject had a score of one for syntax, due to lack of varied sentence structure and telegraphic speech. Coherence was rated as one as well, due to the random, disjointed nature of the discourse and occasional echolalia.

Topic maintenance was rated as one, with the subject often changing the topic. The subject seemed unable to identify the topic at times, perseverated to previous topics, and often seemed to have a separate conversation from that of the spouse and examiner. Initiation of conversation was rated as two due to the taciturn nature of the subject's discourse, and the subject seldom asked questions to clarify when it was apparent the message was not understood.

Although verbal output was limited, overall discourse was marked by unclear references and message inaccuracies. The subject appeared to have difficulty interpreting his surroundings, not only with visual stimuli presented as part of the tasks, but also with persons and objects in the environment. For instance, the subject looked directly at his spouse, but was unable to identify that person as his spouse. However, it should be noted that the subject passed the visual screening both initially and at the second measurement.

Content units were greatly reduced in comparison to all other subjects. Two out of twelve possible content units were identified in the Picture Description task, and one out of thirty-three possible content units was identified in the Story Generation task. During the Video Narration task, one content unit (7%) was identified. No content units were recalled in the Video Retelling or Story Retelling tasks.

Subject Eight chose not to participate in measure two. For measure one, the subject was classified at Stage Six on the <u>Global Deterioration Scale</u>. Discourse had poor syntax, decreased coherence and difficulty with topic maintenance, according to ratings below five on the Conversational Rating Scale. Additionally, the subject often exhibited apparent confusion as to what the current topic was. Overall, discourse was marked by personal experience/evaluation, message inaccuracy, nonspecific vocabulary, neologisms, and unclear reference.

The subject recalled five information units (36%) from the Story Retelling task, and two units from the Video Retelling task (13%). Four of the possible twelve information units were related during the Picture Description task, and eight of the possible thirty-three content units were related during the Story Generation task.

Initially, Subject Nine was rated at <u>GDS</u> Stage Five, and progressed to Stage Six for the final measure. The final measurement was taken seven months and two weeks after the first one, due to the subject being out of the country. Initial characteristics of the subject's discourse included message inaccuracy, nonspecific vocabulary, unclear reference, and neologisms. These characteristics continued during measure two, with neologisms and unclear references increasing in proportion of errors across the majority of

discourse tasks. Additionally, linguistic nonfluencies and personal experience/evaluation became characteristics of the subject's discourse.

Syntax, coherence of narrative, and topic maintenance all received ratings below five on the Conversational Rating Scale, for measures one and two. This was largely because the subject had a number of utterances which were illogical and incomprehensible to the listener. An example is "I was down at the building and I was doing what the building was doing," in response to a question about her vacation. Another would be, "I think that she would seldom stand that feet that's in that feet that's being undone. I mean, it's a good idea, but it would be nicer if it wasn't quite," which was said in reference to the Picture Description task.

CHAPTER IV

DISCUSSION

The purpose of this study was to examine the changes of
discourse over time in adults with Alzheimer's disease. It
compared subjects at Global Deterioration Scale Stages Three
through Seven to establish prevalent characteristics at each
stage. It also compared subjects to themselves, to assess
change over time. Finally, it compared task measures to
determine which were most sensitive to change.

The findings were that, as subjects progressed,
syntactic abilities (especially the variety of syntactic
forms), topic maintenance, and cohesion deteriorated, while
intelligibility of speech was maintained. Due to the nature
of Alzheimer's Disease being primarily cognitive (as opposed
to motoric) deterioration until the final stages (Reisberg,
Ferris, DeLeon, & Crook, 1982), it would logically follow
that this would occur.

Use of unclear references was a characteristic of
discourse that occurred frequently in early stages of DAT
and increased with the severity of stage. This occurred
across all tasks to some degree. This supports previous
hypotheses that people with Alzheimer's Disease have

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difficulty in considering the viewpoint of the listener (e.g., Hamilton, 1994).

Additionally, revisions declined after Stage Four. This could be due to a decreased awareness of errors or a failure to consider the listener's point of view.

Difficulty maintaining the topic, decrease in coherence of discourse, decrease in number of content units, overuse of unclear references, and decrease in amount of revisions could be an indication that, although the overlearned social conventions remain appropriate (Fromm & Holland, 1989), adults with Alzheimer's Disease primarily have difficulty with semantic and pragmatic aspects of communication. Although the form of the subjects' discourse was generally adequate, the breakdown centered primarily in the content and function of discourse.

Inappropriate responses were not common in the majority of tasks, with the exception of the unstructured Conversation task, when 63% of subjects were judged to have at least one inappropriate response. This may be a result of the increased opportunity to occur due to the interactive nature of the task. This further supports the notion that adults with Alzheimer's Disease have difficulty with pragmatic aspects of discourse.

One of the most commonly double-coded combinations in utterances was irrelevant statements and personal

experience/evaluation. As an overall trend, irrelevant statements were not common until Stage Five. At that point, they often accounted for a large portion of subjects' errors. However, personal experience/evaluation occurred frequently across all stages. This points to an increasing inability to make comments that clearly relate to the task at hand. Initially, subjects may have had tangential comments that, although not adding to the information conveyed for the desired task, were not unrelated to the task. (e.g. "I love to go to the mountains," as an utterance for a Story Generation task, was classified as personal experience/evaluation because it did not add to the topic of describing a picture about a family that was picnicking in the mountains.) However, in the later stages, a subject may have become off-topic in a different manner. For example, talking about how important it is for a child to have someone to listen to him or her, when the task at hand is to tell a story about a picture that depicts a boy preparing to wake his father with a horn at the stroke of midnight on New Year's Eve. This is only remotely related to the picture, and therefore, is not only personal experience/evaluation, but also irrelevant.

The tasks that measured content units generated by the subjects (Story Generation, Video Narration/Retelling, and Picture Description) showed the most change over time.

Average percentages of utterances with problem behaviors for each stage showed an increase for every task except Procedural Explanation, which showed a decrease in percentage of utterances with problem behaviors. However, the variability of scores within each stage prohibits making a clear distinction among subjects based solely on percentage of errors.

Subjects had the lowest percentage of utterances with problem behaviors during the Video Narration task, perhaps because they could choose to discuss any event that interested them and with which they felt sure of their verbal capabilities, without feeling the pressure to discuss everything available. Subjects had the highest percentage of utterances with problem behaviors during the Story Generation task. Subjects often struggled to interpret the subtle nuances of the pictures, and this additional processing load was reflected in their discourse.

The tasks appeared to be varied enough for each to provide additional information in interpreting the discourse patterns of the subjects.

In this study, revisions were dramatically reduced after Stage Four across all tasks. Illes (1989) noted that the discourse of subjects in early stages of Alzheimer's disease was marked by self-corrective strategies. McNamara, Obler, Au, Durso & Albert (1992) reported that subjects with

Alzheimer's disease (mild to moderate stages) had decreased
self-monitoring when compared to subjects with Parkinson's
Disease and normally-aging adults. Subjects with DAT
repaired only 24% of all linguistic errors in their speech.

Illes stated that verbal deviations (i.e., neologisms,
paraphasias, etc.) were observed in early stages of
Alzheimer's disease. In the current research, neologisms
were present occasionally in Stages Three and Four, but
increased greatly with the later stages.

Hier, Hagenlocker & Shindler (1985) reported that
syntactic complexity was decreased and speech was more
telegraphic in nature for subjects with Alzheimer's disease
in comparison to subjects with stroke-related dementia and
normal controls. The stimulus material was the Cookie Theft
picture from the BDAE, which was used for the picture
description task of this study. Illes (1989) also noted that
syntactic complexity decreased with later stages of
Alzheimer's disease. This was also true for the current
study, although the measures were not as in-depth as those
used in Illes's study. In contrast, Appell, Kertesz, &
Fisman (1982) stated that the subjects of their study had
intact syntactic abilities and grammatically correct
sentences.

Additionally, this study is in agreement with Bayles,
Boone, Tomoeda, & Slauson (1989) who reported that as

Alzheimer's disease progressed, subjects produced fewer informational units in picture description tasks. Similarly, Tomoeda & Bayles (1993) found in their five-year longitudinal study of three subjects that the measure most sensitive to change over time was the content units. However, Smith, Chenery & Murdoch (1989) noted that their subjects with DAT did not differ from controls in the amount of informational units related during a picture description task.

Mentis, Briggs-Whittaker, & Gramigna (1995) reported a decrease of topic management in patients with Alzheimer's disease, and further noted that those with the lowest Mini Mental Status Examination scores had the greatest topic management difficulty. Further, coherence was reduced in subjects with Alzheimer's disease in comparison to normal controls. The results of this study coincide with that of Ellis (1996) who found that adults with Alzheimer's disease tend to become less coherent as they progress. The present study found that coherence and topic maintenance decreased with increasing severity of Alzheimer's disease, and that the majority of subjects deteriorated in these skills over time.

Future research could incorporate the use of normally aging adults as controls, to provide a basis of comparison. Also, more subjects could be added at Stages Three and

Seven, to expand the information that was obtained in this study.

Analytically, measures could be incorporated to reflect the number of requestive utterances that are often characteristic of discourse in adults with Alzheimer's (Ripich, et al., 1991). Some subjects would have had a notable difference in the percentage of utterances with problem behaviors if this had been incorporated. For example, some subjects had a high proportion of utterances such as "What's he doing?" (Video Narration task), "Is that a dog?" (Story Generation task) or other questions that do not add to the information generated and may indicate a lack of ability to interpret the presented stimuli. Further analysis procedures that could provide valuable data include the addition of a measure of conciseness as described by Tomoeda and Bayles (1993). In this study, some subjects, particularly in earlier stages, were noted to be verbose, but this was not directly addressed in the current analysis procedure.

This study provides useful information concerning the performance of subjects with Alzheimer's-related dementia across a variety of discourse tasks with varying memory loads, semantic implications, and structure. The variety of tasks and the variability of performance will help future researchers, as well as clinicians, choose appropriate tasks

that are sensitive to the information they are seeking. It also shows that, while the proportion of each problem behavior varies with <u>Global Deterioration Scale</u> rating, subjects themselves have a certain continuity (i.e., a problem behavior does not necessarily disappear with time) in their discourse behaviors.

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APPENDIXES

APPENDIX A

CONSENT FORM

I, _____, hereby authorize Nancy E. Monroe, Ph.D., Cheryl Scott, Ph.D., Connie Stout, Ph.D., or Tonya Wong, B.S., to perform the following procedures:

1. Gather language samples every one to two months for the period of one year. The tasks will include:
   a. describing or telling a story about what appears to be occurring in pictures
   b. retelling a story read by the examiner
   c. summarizing the events in a short silent film
   d. conversation with the examiner
   e. telling how to do an everyday procedure

2. Analyze the language samples.

3. Audiotape the spoken samples for later analysis.

Individuals' names will be kept confidential. In the study, they will be referred to only by an assigned number. Audiotapes will be used only by investigators, and will be destroyed at the completion of this study.

This is done as part of an investigation entitled A Longitudinal Study of Discourse in Adults with Alzheimer's Disease. Individuals will be involved with the study for one year.

I understand that participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director.

I may contact Nancy Monroe at (405) 744-8942. I may also contact Gay Clarkson, Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone number: (405) 744-5700 should I wish to have more information about the research.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date:_____   Time:_____ (A.M./ P.M.)

Signed:_____
                                     Signature of Subject

I, _____, as a relative or caregiver of the aforementioned individual, have read and understand this document and consent to his/her participation in this research study. I have been informed of my right to observe any testing that is given to this subject. I do____ do not____ wish to be present during testing. Should I choose to change my decision concerning the attendance of testing at a later date, I need only to give written notice to the project director.

Signed: _____
             Signature of relative or caregiver

I certify that I have personally explained all elements of this form to the subject or his/her representative before requesting the subject or his/her representative to sign it.

Signed: _____
             Project Director

APPENDIX B

ANALYSIS FORMS

Overall Measures	
Date:	
Conversational Rating Scale	
Intelligibility	
Syntax	
Coherence of Narrative	
Topic Maintenance	
Initiation of Communication	

Scale:

Intelligibility:

1. Speech is severely distorted and consistently requires repetition
3. Speech is moderately distorted; can be understood approx. 30-40% of the time
5. Speech is mildly distorted; requires repetition approx. 10% of the time
7. Speech is minimally impaired, but is generally intelligible
9. No discernible speech impairment; always understood

Syntax:

1. Consistently uses ungrammatical sentences; only short phrases and "telegraphic"
3. Omits grammatical function words often; avg. sentence length is reduced most of the time
5. Uses mainly simple sentences; infrequent embedding and clauses
7 Uses varied sentence patterns 75% of the time
9. Mature and varied sentence patterns consistently used

Coherence of Narrative:

1. Consistently random and diffuse expression; incomplete thoughts
3. Disjointed verbal style; limited connection between ideas
5. Thoughts are expressed with a moderate amount of irrelevant and extraneous remarks, and are considered incomplete 50% of time
7 Ideas are expressed in some order approximately 75% of the time; notice occasional incomplete thoughts
9. Shows a well-executed expression of ideas most of the time; a well-formed narrative

Topic Maintenance:

1 Rapid and abrupt shifting from topic to topic within a short time
3. Able to maintain topic for at least 30 seconds
5. Can maintain topic for several minutes, but demonstrates difficulty in changing to a new topic
7. Can appropriately maintain the topic most of the time; infrequently (25% of the time) shows slowness & difficulty in change of topic
9. Demonstrates no problem in maintenance and change of topic

Initiation of Communication

1. Infrequently initiates talk; only responds to others' questions
3. Seldom initiates talk (about 25% of the time)
5. Limited initiation of talk (about 50% of the time)
7 Minimal problem in initiating conversational talk
9. Freely initiates talk; good balance of communication most of the time

**Excerpted from: "Rating Communication Behaviours in the Head-Injured Adult" by J. Ehrlich and P. Barry, 1989, *Brain Injury*, 3, pp. 197-198. Copyright 1989 by Taylor and Francis.

Qualitative/Quantitative Discourse Analysis Protocol

Cookie Theft Picture

Date:

Discourse Analysis	
Insufficient information	
Nonspecific vocabulary	
Informational redundancy	
Message inaccuracy	
Poor topic maintenance	
Inappropriate responses	
Linguistic nonfluency	
Revision	
Unclear reference	
Errors in pronoun use	
Naming errors	
Irrelevant statements	
Personal experience/evaluation	
Excessive detail	
Neologisms	
Abandoned thoughts	
Total utterances	
Total discourse problem behaviors	
Total utterances with behaviors	
% utterances with problem behaviors	
Content Units	
Setting: kitchen, mom, boy, girl (max 4)	
Events: mom washing dishes, boy getting cookies	
boy on stool, girl eating cookies, sink overflowing,	
girl watching (max 6)	
Gist: mom is daydreaming, boy in danger (max 2)	

Procedure

(two of: getting ready to go to dr., A.M. routine, P.M. routine, preparing for a trip)

Date:

Discourse Analysis	
Insufficient information	
Nonspecific vocabulary	
Informational redundancy	
Message inaccuracy	
Poor topic maintenance	
Inappropriate responses	
Linguistic nonfluency	
Revision	
Unclear reference	
Errors in pronoun use	
Naming errors	
Irrelevant statements	
Personal experience/evaluation	
Excessive detail	
Neologisms	
Abandoned thoughts	
Total utterances	
Total discourse problem behaviors	
Total utterances with behaviors	
% utterances with problem behaviors	
Content units (correct, nonredundant)	

Story Generation	
Date:	
Football Game	
Setting: Man, football game, cold outside gate 8, exit ramp (max 5)	
Events: leaving game, W beat C, end of game, (max 3)	
Gist: Man is angry, his team lost (max 2)	
New Year's Eve	
Setting: boy, man, living room (den), New Year's Eve, in front of TV (max 5)	
Events: watching TV, count down until 12 man is sleeping, boy is holding horn (4)	
Gist: When it is 12, boy will blow horn & wake man (max 3)	
Picnic	
Setting: family, desert, cows, station wagon, summer (max 5)	
Events: picnicing, family hiding in car, cows eating lunch (max 3)	
Gist: picnic was interrupted by cows who are finishing their lunch, family unsure what to do (max 3)	
Discourse Analysis	
Insufficient information	
Nonspecific vocabulary	
Informational redundancy	
Message inaccuracy	
Poor topic maintenance	
Inappropriate responses	
Linguistic nonfluency	
Revision	
Unclear reference	
Errors in pronoun use	
Naming errors	
Irrelevant statements	
Personal experience/evaluation	
Excessive detail	
Neologisms	
Abandoned thoughts	
Total utterances	
Total discourse problem behaviors	
Total utterances with behaviors	
% utterances with problem behaviors	

Frog Goes to Dinner Video	
Date:	
Discourse Analysis	
Insufficient information	
Nonspecific vocabulary	
Informational redundancy	
Message inaccuracy	
Poor topic maintenance	
Inappropriate responses	
Linguistic nonfluency	
Revision	
Unclear reference	
Errors in pronoun use	
Naming errors	
Irrelevant statements	
Personal experience/evaluation	
Excessive detail	
Neologisms	
Abandoned thoughts	
Total utterances	
Total discourse problem behaviors	
Total utterances with behaviors	
% utterances with problem behaviors	
Narration (simultaneous w/ video)	
Content units (correct, nonredundant)	
Retelling (immediately after video)	
Content units (correct, nonredundant)	
Use of cohesive markers (first, then...)	
Correct order of events (reasonably close)	

Frog Goes to Dinner
Content Units

1. A Boy
2. A Frog
3. Restaurant
4. Frog Escapes
5. Frog is in/blown out of Tuba
6. Frog Lands in Lobster Tank
7. Frog in Lady's Salad
8. People Leave (any)
9. Frog in Water Pitcher/Glass
10. Frog in Kitchen
11. Chef Chases Frog
12. Mess in Kitchen
13. Chef Was Going to Cook Frog
14. Frog is Saved
15. Family Return Home

Total Content Units:	Percentage:
1	7%
2	13%
3	20%
4	27%
5	33%
6	40%
7	47%
8	53%
9	60%
10	67%
11	73%
12	80%
13	87%
14	93%
15	100%

APPENDIX C

GLOBAL DETERIORATION SCALE RATINGS CHARACTERISTICS

Summary of Global Deterioration Ratings
Characteristics

Adapted from Reisberg, B., Ferris, S., DeLeon. M.. & Crook, T. (1982)
"The global deterioration scale for assessment of primary degenerative dementia"
American Journal of Psychiatry. 139, 1136-1139.

Stage One: No cognitive decline.

Stage Two: Very mild cognitive decline.

Stage of early forgetfulness, for which the person may display appropriate concern.

Stage Three: Mild cognitive decline.

Earliest clear-cut deficits appear. Decreased performance in demanding work and social situations. Those closest to person may notice word-finding and name recollection difficulties. Person may get lost while travelling to a new place. May lose/misplace valuables. Denial and/or mild to moderate anxiety may be present. Person may make no errors on 10-item Mental Status Questionnaire (MSQ).

Stage Four: Moderate cognitive decline.

Late confusional phase. Concentration difficulty on serial subtractions. Decreased recollection of recent events in person's own life and/or current events, although well-oriented to temporal and biographical information. Can distinguish acquaintances from strangers. Travelling alone and managing finances become problematic (although travelling to familiar places may not present difficulty). Denial, flattening of affect and withdrawal from previously challenging situations may occur.

Stage Five: Moderately severe cognitive decline.

Early dementia. Cannot survive without assistance. Have difficulty remembering address, telephone number, names of grandchildren, etc. Generally know own name and spouse/children's names. Generally can toilet and feed self independently. May choose inappropriate clothing.

Stage Six: Severe cognitive decline.

Middle phase of dementia. May forget name of spouse or caregiver, as well as majority of recent events in life. Knowledge of past is sketchy. Not oriented to basic temporal or spatial information. Diurnal rhythm difficulties. Need great assistance for activities of daily living. Generally can recall own name. Personality and emotional changes.

Stage Seven: Very severe cognitive decline.

Late dementia. Frequently lose speech skills. Require assistance for eating. Losing psychomotor skills such as ability to walk.

APPENDIX D

TABLES

Table 10

Comparison of Problem Behaviors for Subject One

Behavior	Measure Task	1 PD	2 PD	1 PE	2 PE	1 SG	2 SG	1 VN	2 VN	1 VR	2 VR	1 UC	2 UC	1 SR	2 SR
Abandoned Thoughts				14%	10%	3%	8%	43%	9%	25%		24%	11%		
Errors in Pronoun Use															
Excessive Detail															
Inappropriate Responses												4%	7%		
Informational Redundancy		20%	17%		10%	9%	19%					12%	4%		
Insufficient Information						13%						8%	4%		
Irrelevant Statements					5%								4%		
Linguistic Nonfluency			17%	14%	5%	22%	4%	14%			14%	16%	7%		
Message Inaccuracy		40%	17%		30%	19%	38%	29%	5%		14%				
Naming Errors															
Neologisms															
Nonspecific Vocabulary					5%	6%				25%			11%		
Personal Experience/Evaluation		20%				9%	12%		64%	25%	29%				
Poor Topic Maintenance													11%		
Revision			17%	71%	5%	9%	12%	14%	14%	25%	14%	24%	11%		
Unclear Reference		20%	33%		30%	9%	8%		9%		29%	4%	32%		
Total Utterances		9	13	16	23	36	27	20	50	7	11	94	60		
Total Problem Behaviors		5	6	7	20	32	26	7	22	4	7	25	28		
Utterances w/ Problem Behavior		5	4	5	11	23	19	6	19	3	7	20	21		
% Utterances w/ Problem Behavior		56%	31%	31%	48%	64%	70%	30%	38%	43%	64%	21%	35%		
Content Units		7	7	4	7	19	13	4	5	2	4			3	6
Setting		3	3			8	7								
Events		3	3			5	5								
Gist		1	1			4	1								
Cohesive Markers										2	6				
Correct Order										yes	yes				

Note: Percentages shown represent the percentage of total discourse problems.
PD = picture description. PE = procedural explanation. SG = story generation.
VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling.

Table 11

Comparison of Problem Behaviors for Subject Two

Behavior	1 PD	2 PD	1 PE	2 PE	1 SG	2 SG	1 VN	2 VN	1 VR	2 VR	1 UC	2 UC	1 SR	2 SR
Abandoned Thoughts							5%	3%						
Errors in Pronoun Use		8%	7%					3%						
Excessive Detail														
Inappropriate Responses														
Informational Redundancy	22%	8%	36%		6%	17%		6%	20%		17%	19%		
Insufficient Information			7%		6%									
Irrelevant Statements	6%			33%	6%									
Linguistic Nonfluency	6%		43%	11%	22%		38%	6%	40%		83%	30%		
Message Inaccuracy					22%	22%	5%	3%	30%	100%				
Naming Errors														
Neologisms														
Nonspecific Vocabulary	6%					6%		6%				4%		
Personal Experience/Evaluation	33%	69%	7%	56%	33%	33%	16%	42%						
Poor Topic Maintenance														
Revision	6%	8%				17%	16%	13%				26%		
Unclear Reference	22%	8%			6%	6%	19%	16%	10%			22%		
Total Utterances	24	23	21	7	30	25	80	87	18	6	41	82		
Total Problem Behaviors	18	13	14	9	18	18	37	31	10	2	6	27		
Utterances w/ Problem Behavior	15	12	13	5	16	15	33	25	6	2	6	23		
% Utterances w/ Problem Behavior	63%	52%	62%	71%	53%	60%	41%	29%	33%	33%	15%	28%		
Content Units	12	10	6	7	17	16	15	14	6	3			8	12
Setting	4	3			8	5								
Events	6	5			5	6								
Gist	2	2			4	5								
Cohesive Markers									7	5				
Correct Order									yes	yes				

Note: Percentages shown represent the percentage of total discourse problems.

PD = picture description. PE = procedural explanation. SG = story generation.

VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling.

Table 12
Comparison of Problem Behaviors for Subject Three

Behavior	Measure	1	2	1	2	1	2	1	2	1	2	1	2	1	2
	Task	PD	PD	PE	PE	SG	SG	VN	VN	VR	VR*	UC	UC	SR	SR
Abandoned Thoughts		2%	1%	2%		4%	2%	6%	16%			8%	4%		
Errors in Pronoun Use			<1%				1%					1%			
Excessive Detail															
Inappropriate Responses															
Informational Redundancy		8%	1%	1%		4%	5%	4%		2%		6%	15%		
Insufficient Information						2%									
Irrelevant Statements		24%	39%	27%	57%	25%	28%	27%	23%	13%		2%			
Linguistic Nonfluency		4%	7%	18%	27%	21%	12%	4%		21%		29%	17%		
Message Inaccuracy			<1%	1%		8%	6%	1%	6%	4%		2%			
Naming Errors		2%		2%						2%			2%		
Neologisms															
Nonspecific Vocabulary		2%	<1%	1%		<1%									
Personal Experience/Evaluation		22%	39%	24%		29%	34%	52%	39%	53%					
Poor Topic Maintenance			2%	2%	10%	1%	2%					16%			
Revision		4%	3%	2%		<1%	4%	4%	6%			8%	7%		
Unclear Reference		32%	7%	19%	7%	6%	5%	1%	10%	4%		27%	54%		
Total Utterances		44	122	54	45	135	186	114	63	36		80	64		
Total Problem Behaviors		50	284	85	30	185	211	96	31	47		51	46		
Utterances w/ Problem Behavior		28	116	40	24	101	113	58	19	32		42	34		
% Utterances w/ Problem Behavior		70%	95%	75%	67%	75%	61%	51%	30%	89%		53%	74%		
Content Units		10	5	7	7	7	17	8	4**	4				10	12
Setting		3	3			6	9								
Events		5	2			1	4								
Gist		2	0			0	4								
Cohesive Markers										6					
Correct Order										yes					

Note: Percentages shown represent the percentage of total discourse problems. PD = picture description. PE = procedural explanation. SG = story generation. VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling. * = no data exist for this task. ** = due to a portion of this task being unavailable for analysis, the 4 content units represent 50% of total possible.

Table 13
Comparison of Problem Behaviors for Subject Four

Behavior	Measure Task	1 PD	2 PD	1 PE	2 PE	1 SG	2 SG	1 VN	2 VN	1 VR	2 VR	1 UC	2 UC	1 SR	2 SR
Abandoned Thoughts				6%	8%	13%	5%	7%	21%	18%		13%	18%		
Errors in Pronoun Use										9%					
Excessive Detail						14%	7%								
Inappropriate Responses												13%	9%		
Informational Redundancy		50%		6%			5%								
Insufficient Information															
Irrelevant Statements				47%	31%					9%					
Linguistic Nonfluency				3%	8%	19%	5%	13%	5%	9%	33%	26%	18%		
Message Inaccuracy						25%	29%	7%	11%				18%		
Naming Errors								5%	7%	5%					
Neologisms					8%										
Nonspecific Vocabulary															
Personal Experience/Evaluation		50%		3%	31%		14%	20%	21%						
Poor Topic Maintenance												9%			
Revision				6%	8%	31%	10%	33%	32%	37%		22%	18%		
Unclear Reference				28%	15%	13%	14%	13%	11%	18%	67%	17%	18%		
Total Utterances		8	5	32	15	26	26	56	49	21	9	61	40		
Total Problem Behaviors		2	0	32	13	16	21	15	19	11	3	23	11		
Utterances w/ Problem Behavior		2	0	22	8	11	15	10	16	11	3	19	9		
% Utterances w/ Problem Behavior		25%	<1%	69%	53%	42%	58%	18%	33%	48%	33%	31%	23%		
Content Units		7	7	5	5	18	20	14	13	10	6			13	12
Setting		3	3			9	12								
Events		4	3			5	3								
Gist		0	1			4	5								
Cohesive Markers										17	9				
Correct Order										yes	yes				

Note: Percentages shown represent the percentage of total discourse problems.
PD = picture description. PE = procedural explanation. SG = story generation.
VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling

Table 14
Comparison of Problem Behaviors for Subject Five

Behavior	Measure: Task	1 PD*	2 PD	1 PE	2 PE	1 SG*	2 SG	1 VN	2 VN	1 VR	2 VR	1 UC	2 UC	1 SR	2 SR
Abandoned Thoughts			8%	33%					20%	25%			6%			
Errors in Pronoun Use										13%						
Excessive Detail																
Inappropriate Responses													6%			
Informational Redundancy								9%			40%		6%	8%		
Insufficient Information																
Irrelevant Statements																
Linguistic Nonfluency			15%		11%		4%	20%				6%	4%		
Message Inaccuracy			15%		11%		40%	20%	25%	30%	33%	19%			
Naming Errors							9%					6%			
Neologisms			15%	33%	11%		9%		38%		33%	6%	8%		
Nonspecific Vocabulary										10%		31%	13%		
Personal Experience/Evaluation			8%				4%	40%							
Poor Topic Maintenance																
Revision				11%			4%				17%		8%		
Unclear Reference			38%	22%	67%		22%			20%	17%	13%	58%		
Total Utterances			18	24	21		26	31	32	21	12	54	47		
Total Problem Behaviors			13	9	9		23	5	8	10	6	16	24		
Utterances w/ Problem Behavior			10	7	8		16	5	7	9	4	13	21		
% Utterances w/ Problem Behavior			56%	29%	38%		62%	16%	22%	43%	33%	24%	45%		
Content Units			3	4	0		3	4	2	0	0			0	0
Setting			3				2								
Events			0				0								
Gist			0				1								
Cohesive Markers										4	1				
Correct Order										–	–				

Note: Percentages shown represent the percentage of total discourse problems. PD = picture description. PE = procedural explanation. SG = story generation. VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling. * = no data exist for this task.

Table 15
Comparison of Problem Behaviors for Subject Six

Behavior	Measure Task	1 PD	2 PD	1 PE	2 PE	1 SG	2 SG	1 VN	2 VN	1 VR	2 VR	1 UC	2 UC	1 SR	2 SR
Abandoned Thoughts			20%				17%	23%	20%		9%	13%	7%		
Errors in Pronoun Use															
Excessive Detail															
Inappropriate Responses						14%	6%					4%			
Informational Redundancy				29%	50%		6%					4%			
Insufficient Information								15%							
Irrelevant Statements						14%	8%								
Linguistic Nonfluency						7%	8%			13%	9%	17%	27%		
Message Inaccuracy				14%	50%	14%	28%	8%	40%	38%	9%				
Naming Errors						7%									
Neologisms						7%				13%		4%			
Nonspecific Vocabulary				58%								9%			
Personal Experience/Evaluation		60%				29%		15%	20%	13%					
Poor Topic Maintenance											9%		13%		
Revision		40%	80%				6%				9%	9%	27%		
Unclear Reference						7%	39%	23%	20%	25%	55%	39%	27%		
Total Utterances		14	9	21	6	20	25	38	8	14	10	63	51		
Total Problem Behaviors		5	5	7	2	14	18	13	5	8	11	23	15		
Utterances w/ Problem Behavior		5	5	6	2	13	15	13	5	5	8	22	14		
% Utterances w/ Problem Behavior		36%	56%	29%	33%	65%	60%	34%	63%	36%	80%	35%	27%		
Content Units		8	1	4	2	6	8	4	1	1	2			3	6
Setting		3	0			4	5								
Events		4	1			2	3								
Gist		1	0			0	0								
Cohesive Markers										3	0				
Correct Order										-	yes				

Note: Percentages shown represent the percentage of total discourse problems.
PD = picture description. PE = procedural explanation. SG = story generation.
VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling

Table 16

Comparison of Problem Behaviors for Subject Seven

Behavior	Measure Task	1 PD *	2 PD	1 PE *	2 PE	1 SG *	2 SG	1 VN *	2 VN	1 VR *	2 VR	1 UC *	2 UC	1 SR *	2 SR
Abandoned Thoughts									14%						
Errors in Pronoun Use															
Excessive Detail															
Inappropriate Responses													13%		
Informational Redundancy															
Insufficient Information															
Irrelevant Statements															
Linguistic Nonfluency															
Message Inaccuracy			13%				60%		57%				13%		
Naming Errors															
Neologisms			25%												
Nonspecific Vocabulary							20%						13%		
Personal Experience/Evaluation															
Poor Topic Maintenance															
Revision															
Unclear Reference			63%		100%		20%		29%				63%		
Total Utterances			6		4		9		12		2		21		
Total Problem Behaviors			8		1		5		7		0		8		
Utterances w/ Problem Behavior			6		1		5		7		0		8		
% Utterances w/ Problem Behavior			100%		25%		56%		58%		<1%		38%		
Content Units			2		3		1		1		0				0
Setting			2				1								
Events			0				0								
Gist			0				0								
Cohesive Markers											0				
Correct Order											–				

Note: Percentages shown represent the percentage of total discourse problems. PD = picture description. PE = procedural explanation. SG = story generation. VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling. * = no data were available for this task.

Table 17

Comparison of Problem Behaviors for Subject Eight

Behavior	Measure Task	1 PD	2 PD*	1 PE	2 PE*	1 SG	2 SG*	1 VN	2 VN*	1 VR	2 VR*	1 UC	2 UC*	1 SR	2 SR*
Abandoned Thoughts						4%		4%				3%			
Errors in Pronoun Use															
Excessive Detail															
Inappropriate Responses												3%			
Informational Redundancy						4%		1%							
Insufficient Information						4%		3%				11%			
Irrelevant Statements				27%				22%		17%					
Linguistic Nonfluency						9%						9%			
Message Inaccuracy		40%		9%		9%		8%		13%		9%			
Naming Errors								3%							
Neologisms		40%		9%		4%		1%							
Nonspecific Vocabulary				9%		9%		3%		4%		11%			
Personal Experience/Evaluation				27%		22%		24%		17%					
Poor Topic Maintenance								5%		8%					
Revision								1%				3%			
Unclear Reference		20%		18%		35%		25%		42%		51%			
Total Utterances		6		18		20		114		38		57			
Total Problem Behaviors		5		11		23		76		24		35			
Utterances w/ Problem Behavior		3		7		17		51		19		33			
% Utterances w/ Problem Behavior		50%		39%		85%		45%		50%		58%			
Content Units		4		4		8		5		2				5	
Setting		2				5									
Events		2				2									
Gist		0				1									
Cohesive Markers										5					
Correct Order										no					

Note: Percentages shown represent the percentage of total discourse problems. PD = picture description. PE = procedural explanation. SG = story generation. VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling. * = no data available for this subject on this task.

Table 18
Comparison of Problem Behaviors for Subject Nine

Behavior	Measure Task	1 PD	2 PD	1 PE	2 PE	1 SG	2 SG	1 VN	2 VN	1 VR	2 VR	1 UC	2 UC	1 SR	2 SR
Abandoned Thoughts			4%						6%			2%	5%		
Errors in Pronoun Use		12%										2%			
Excessive Detail				3%											
Inappropriate Responses						4%		6%				4%	3%		
Informational Redundancy							5%					8%			
Insufficient Information												2%			
Irrelevant Statements						4%									
Linguistic Nonfluency			4%	8%			12%	6%	8%		5%	8%	13%		
Message Inaccuracy		12%	8%	8%		24%	19%	18%	8%	46%	25%	8%			
Naming Errors						12%						2%			
Neologisms		18%	17%	5%	29%	4%	16%	12%			15%		5%		
Nonspecific Vocabulary		24%		22%	29%		9%	6%	15%	8%	5%	12%	23%		
Personal Experience/Evaluation			25%	3%		20%	7%	12%	23%		5%				
Poor Topic Maintenance													8%		
Revision				5%		12%					5%	15%	8%		
Unclear Reference		35%	42%	46%	43%	20%	33%	35%	70%	46%	40%	38%	36%		
Total Utterances		13	20	29	8	24	28	28	15	10	9	88	35		
Total Problem Behaviors		17	24	37	7	25	43	17	13	13	20	52	39		
Utterances w/ Problem Behavior		9	15	19	5	17	22	12	11	6	9	42	23		
% Utterances w/ Problem Behavior		69%	75%	66%	63%	71%	79%	43%	73%	60%	100%	48%	66%		
Content Units		5	5	6	3	7	5	2	2	1	1			0	0
Setting		3	3			4	3								
Events		2	2			3	1								
Gist		0	0			0	1								
Cohesive Markers										2	7				
Correct Order										no	no				

Note: Percentages shown represent the percentage of total discourse problems.
PD = picture description. PE = procedural explanation. SG = story generation.
VN = video narration. VR = video retelling. UC = unstructured conversation. SR = story retelling.

Table 19

Comparison of Problem Behaviors for Unstructured Conversation: Raw Data

Behavior	Stage 3 Subject 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts		3	6		4	3	1	2	2	3	2	1	1		1	
Errors in Pronoun Use					1		1									
Excessive Detail																
Inappropriate Responses		3	1			1	2	1		2	1	1	1			1
Informational Redundancy	1		3	5	3	1	4		7	1			1		2	
Insufficient Information			2				1			1			4			
Irrelevant Statements					1					1						
Linguistic Nonfluency	5	6	4	8	15	4	4	2	8	2	5	1	3	1	4	
Message Inaccuracy					1		4	2				3	3			1
Naming Errors							1		2			1				
Neologisms							1				2		1	2		
Nonspecific Vocabulary				1		2	6			3	9	5		4	3	1
Personal Experience/Evaluation																
Poor Topic Maintenance		2			8					3	3				2	
Revision		5	6	7	4	2	8	2	3	3	3		1	2	4	
Unclear Reference		4	1	6	14	9	20	2	25	9	14	2	13	14	4	5
Total Utterances	41	61	94	82	80	63	88	40	64	60	35	54	57	47	51	21
Total Problem Behaviors	6	23	25	27	51	23	52	11	46	28	39	16	35	24	15	8
Utterances w/ Problem Behavior	6	19	20	23	42	22	42	9	34	21	23	13	33	21	14	8
% Utterances w/ Problem Behavior	15%	31%	21%	28%	53%	35%	48%	23%	74%	35%	66%	24%	58%	45%	27%	38%

Note: In each column heading, the first number is the number of the subject, the second number is the number of the measure.

Table 20

Comparison of Problem Behaviors for Picture Description: Raw Data

Behavior	Stage 3 / Subject 2-1	4 / 4-1	4 / 1-1	4 / 2-2	5 / 3-1	5 / 6-1	5 / 9-1	5 / 4-2	5 / 3-2	5 / 1-2	6 / 9-2	6 / 5-1 *	6 / 8-1	6 / 5-2	6 / 6-2	7 / 7-2
Abandoned Thoughts					1				3		1			1	1	
Errors in Pronoun Use				1			2		1							
Excessive Detail																
Inappropriate Responses																
Informational Redundancy	4	1	1	1	4				2	1						
Insufficient Information																
Irrelevant Statements	1				12				110							
Linguistic Nonfluency	1				2				21	1	1			2		
Message Inaccuracy			2				2		1	1	2		2	2		1
Naming Errors					1											
Neologisms							3				4		2	2		2
Nonspecific Vocabulary	1				1		4		1							
Personal Experience/Evaluation	6	1	1	9	11	3			112		6			1		
Poor Topic Maintenance									5							
Revision	1			1	2	2			9	1					4	
Unclear Reference	4		1	1	16		6		19	2	10		1	5		5
Total Utterances	24	8	9	23	44	14	13	5	122	13	20		6	18	9	6
Total Problem Behaviors	18	2	5	13	50	5	17	0	284	6	24		5	13	5	8
Utterances w/ Problem Behavior	15	2	5	12	28	5	9	0	116	4	15		3	10	5	6
% Utterances w/ Problem Behavior	63%	25%	56%	52%	70%	36%	69%	0%	95%	31%	75%		50%	56%	56%	100%
Content Units	9	7	7	10	10	8	5	7	5	8	5		4	3	1	2
Setting	3	3	3	3	3	3	3	3	3	3	3		2	3	0	2
Events	4	4	3	5	5	4	2	3	2	4	2		2	0	1	0
Gist	2	0	1	2	2	1	0	1	0	1	0		0	0	0	0

Note: In each column heading, the first number is the number of the subject, the second number is the number of the measure. * = No data were available for this subject on this task.

Table 21

Comparison of Problem Behaviors for Procedural Explanation: Raw Data

Behavior	Stage Subject	3 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts			2	1		2			1		2		3				
Errors in Pronoun Use		1															
Excessive Detail								2									
Inappropriate Responses																	
Informational Redundancy		5				1	2				2					1	
Insufficient Information		1															
Irrelevant Statements			15		3	23		1	4	17	1			3			
Linguistic Nonfluency		6	1	1	1	15		3	1	8	1				1		
Message Inaccuracy						1	1	3			6			1	1	1	
Naming Errors						2											
Neologisms									1			2	3	1	1		
Nonspecific Vocabulary			2			1	4	8			1	2		1			
Personal Experience/Evaluation		1	1		5	20		1	4					3			
Poor Topic Maintenance						2				3							
Revision			2	5		2		2	1		1		1				
Unclear Reference			9			16		17	2	2	6	3	2	2	6		1
Total Utterances		21	32	16	7	54	21	29	15	45	23	8	24	18	21	6	4
Total Problem Behaviors		14	32	7	9	85	7	37	13	30	20	7	9	11	9	2	1
Utterances w/ Problem Behavior		13	22	5	5	40	6	19	8	24	11	5	7	7	8	2	1
% Utterances w/ Problem Behavior		62%	69%	31%	71%	75%	29%	66%	53%	67%	48%	63%	29%	39%	38%	33%	25%
Content Units		6	5	4	7	7	4	6	5	7	7	3	4	4	0	2	3

Note: In each column heading, the first number is the number of the subject, the second number is the number of the measure.

Table 22

Comparison of Problem Behaviors for Story Generation: Raw Data

Behavior	Stage	3	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7
	Subject	2-1	4-1	1-1	2-2	3-1	6-1	9-1	4-2	3-2	1-2	9-2	5-1 *	8-1	5-2	6-2	7-2
Abandoned Thoughts			2	1		7			1	4	2			1		3	
Errors in Pronoun Use										3							
Excessive Detail									3								
Inappropriate Responses							2	1									1
Informational Redundancy		1		2	3	8			1	11	5	2		1	2	1	
Insufficient Information		1		4		3								1			
Irrelevant Statements		1				46	2	1		60							
Linguistic Nonfluency		4	3	7		38	1		1	25	1	5		2	1		
Message Inaccuracy		4	4	6	4	15	2	6	6	13	10	8		2	9	5	3
Naming Errors								1	3	1					2		
Neologisms								1	1			7		1	2		
Nonspecific Vocabulary				3	1	1						4		2			1
Personal Experience/Evaluation		6		3	6	53	4	5	3	72	3	3		5	1		
Poor Topic Maintenance						2				4							
Revision			5	3	3	1		3	2	8	3				1	1	
Unclear Reference		1	2	3	1	11	1	5	3	11	2	14		8	5	7	1
Total Utterances		30	26	36	25	135	20	24	26	186	27	28		20	26	25	9
Total Problem Behaviors		18	16	32	18	185	14	25	21	211	26	43		23	23	18	5
Utterances w/ Problem Behavior		16	11	23	15	101	13	17	15	113	19	22		17	16	15	5
% Utterances w/ Problem Behavior		53%	42%	64%	60%	75%	65%	71%	58%	61%	70%	79%		85%	62%	60%	56%
Content Units (33 possible)		17	18	17	16	7	6	7	20	17	13	5		8	3	8	1
Setting (15 possible)		8	9	8	5	6	4	4	12	9	7	3		5	2	5	1
Events (10 possible)		5	5	5	6	1	2	3	3	4	5	1		2	0	3	0
Gist (8 possible)		4	4	4	5	0	0	0	5	4	1	1		1	1	0	0

Note: In each column heading, the first number is the number of the subject, the second number is the number of the measure. * = no data exist for this subject on this task.

Table 23
Comparison of Problem Behaviors for Video Narration: Raw Data

Behavior	Stage Subject	3 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts		2	1	3	1	6	3	1	4	5	2		1	3	2	1	1
Errors in Pronoun Use					1										1		
Excessive Detail			1														
Inappropriate Responses								1									
Informational Redundancy					2	4								1			
Insufficient Information								2						2			
Irrelevant Statements						26	1			7				17			
Linguistic Nonfluency		14	2	1	2	4	1	1	1			1	1				
Message Inaccuracy		2	1	2	1	1	1	3	2	2	1	1	1	6	2	2	4
Naming Errors			1						1					2			
Neologisms								2						1	3		
Nonspecific Vocabulary					2			1				2		2			
Personal Experience/Evaluation		6	3		13	50	2	2	4	12	14	3	2	18		1	
Poor Topic Maintenance														4			
Revision		6	5	1	4	4			6	2	3			1			
Unclear Reference		7	2		5	1	3	6	2	3	2	9		19		1	2
Total Utterances		80	56	20	87	114	38	28	49	63	50	15	31	114	32	8	12
Total Problem Behaviors		37	15	7	31	96	13	17	19	31	22	13	5	76	8	5	7
Utterances w/ Problem Behavior		33	10	6	25	58	13	12	16	19	19	11	5	51	7	5	7
% Utterances w/ Problem Behavior		41%	18%	30%	29%	51%	34%	43%	33%	30%	38%	73%	16%	45%	22%	63%	58%
Content Units		15	14	4	14	8	4	2	13	4	5	2	4	5	2	1	1

Note: In each column heading, the first number is the number of the subject, the second number is the number of the measure.

Table 24

Comparison of Problem Behaviors for Video Retelling: Raw Data

Behavior	Stage Subject	3 2-1	4 4-1	4 1-1	4 2-2	5 3-1	5 6-1	5 9-1	5 4-2	5 3-2 *	5 1-2	6 9-2	6 5-1	6 8-1	6 5-2	6 6-2	7 7-2
Abandoned Thoughts			2	1												1	
Errors in Pronoun Use			1														
Excessive Detail																	
Inappropriate Responses																	
Informational Redundancy		2				1								4			
Insufficient Information																	
Irrelevant Statements			1			6									4		
Linguistic Nonfluency		4	1			10	1		1		1	1					1
Message Inaccuracy		3			2	2	3	6			1	5	3	3	2	1	
Naming Errors						1											
Neologisms							1					3			2		
Nonspecific Vocabulary				1				1				1	1	1			
Personal Experience/Evaluation				1		25	1				2	1		4			
Poor Topic Maintenance														2		1	
Revision			4	1							1	1			1	1	
Unclear Reference		1	2			2	2	6	2		2	8	2	10	1	6	
Total Utterances		18	21	7	6	36	14	10	9		11	9	21	38	12	10	2
Total Problem Behaviors		10	11	4	2	47	8	13	3		7	20	10	24	6	11	0
Utterances w/ Problem Behavior		6	11	3	2	32	5	6	3		7	9	9	19	4	8	0
% Utterances w/ Problem Behavior		33%	48%	43%	33%	89%	36%	60%	33%		64%	100%	43%	50%	33%	80%	0%
Content Units (15 possible)		6	10	2	3	4	1	1	6		4	1	0	2	0	2	0
Cohesive Markers		7	17	2	5	6	3	2	9		6	7	4	5	1	0	0
Correct Order		yes	yes	yes	yes	yes	-	-	yes		yes	-	-	no	-	yes	-

Note: In each column heading, the first number is the number of the subject, the second number is the number of the measure. * = no data exist for this subject on this task.

Table 25

Comparison of Problem Behaviors for Story Generation: Percentage of Utterances

Behavior	2-1	4-1	1-1	2-2	3-1	6-1	9-1	4-2	3-2	1-2	9-2	5-1*	8-1	5-2	6-2	7-2
Stage	3	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7
Abandoned Thoughts		8%	3%		5%			4%	2%	7%			5%	8%		
Errors in Pronoun Use									2%							
Excessive Detail								12%								
Inappropriate Responses						10%	4%								4%	
Informational Redundancy	3%		8%	12%	6%			4%	6%	19%	7%		5%	8%	4%	
Insufficient Information	3%		11%		2%								5%			
Irrelevant Statements	3%				34%	10%	4%		32%							
Linguistic Nonfluency	13%	12%	19%		28%	5%		4%	13%	4%	18%		10%	4%		
Message Inaccuracy	13%	15%	17%	16%	11%	10%	25%	23%	7%	37%	29%		10%	35%	20%	33%
Naming Errors						5%	13%	4%						8%		
Neologisms						5%	4%				25%		5%	8%		
Nonspecific Vocabulary			6%	4%	1%						14%		10%			11%
Personal Experience/Evaluation	20%		3%	24%	39%	20%	21%	12%	39%	11%	11%		25%	4%		
Poor Topic Maintenance					2%				2%							
Revision		19%	8%	12%	1%		13%	8%	4%	11%				4%	4%	
Unclear Reference	3%	8%	8%	4%	8%	5%	21%	12%	6%	7%	50%		40%	19%	28%	11%
Total Utterances	30	26	36	25	135	20	24	26	186	27	28		20	26	25	9
Total Problem Behaviors	18	16	32	18	185	14	25	21	211	26	43		23	23	18	5
Utterances w/ Problem Behavior	16	11	23	15	101	13	17	15	113	19	22		17	16	15	5
% Utterances w/ Problem Behavior	53%	42%	64%	60%	75%	65%	71%	58%	61%	70%	79%		85%	62%	60%	56%
Content Units (33 possible)	17	18	17	16	7	6	7	20	17	13	5		8	3	8	1
Setting (15 possible)	8	9	8	5	6	4	4	12	9	7	3		5	2	5	1
Events (10 possible)	5	5	5	6	1	2	3	3	4	5	1		2	0	3	0
Gist (8 possible)	4	4	4	5	0	0	0	5	4	1	1		1	1	0	0

Note: Percentages shown represent the percentage of utterances with that problem behavior.
In each column heading, the first number is the number of the subject, the second number is the number of
the measure. * = no data were available for this subject on this task

APPENDIX E

TRANSCRIPT SAMPLES FOR PICTURE DESCRIPTION TASK

Key: E: Examiner
      S: Subject
      >   Abandoned thought
      Words in italics with quotations around them are neologisms

Stage Three

E: Tell me a story about what's going on in this picture.
S: Well, it looks to me like the little boy is fixing to fall and
       The stool he's standing on to reach the cookie jar up in the cabinet is
tipping
       And I don't see anything that's going to keep him from falling, stool and all.
E: I don't either.
S: Unless, for some reason the momma turns around and sees his predicament
and straightens the stool up.
       But I think she must be half asleep because the water is running over in
the sink and into the floor.
       I don't know,
       I don't think she's <unintelligible—volume>
       I don't understand that.
       Looks like her eyes are open.
       Guess she's gonna have a mess to clean up there.
       Have to get the mop and mop up the water that spilled out on the floor.
       And hopefully she'll turn around in time to catch the boy.
       I guess that's her little boy, looks a little bit like her.
       And <unintelligible—volume> dad <unintelligible—volume>
E: Hopefully so. Is there anything else you see in the picture or anything?
S: Well, the little boy I presume it's her brother, is handing her a cookie.
       That's nice.
       (I don't know) I don't know how that's gonna end.
       He's going;
       he's falling.
       One leg of the stool is off of the floor.
       Of course, she could turn around...presumably that's his mother.
       She could turn around and catch him if she turns around, but I don't know.
       She's evidently not very alert because the water's running over the sink
and into the floor.
E: That's what it looks like to me too.

Stage Four

E: For this first one, I want you to tell me what's going on in this picture.
S: Well, the mother is washing or drying dishes
       and the little boy is standing up on the stool
       And the girl is standing there watching him, waiting for him to crash.
       (laughter)

She's already dropped one dish
Or did she?
She must have.

E: Looks like she could have.
Is there anything else?

S: The little boy is beginning to go,
he's going to topple over if he doesn't watch it.

E: Yeah, he could do that.

S: I think she has her hands full.
(laughter)

Stage Five

E: Can you tell me a story about this picture?

S: Oh, she's doing her dishes, and
She's looking out the window.
And probably a next-door dog, or puppy, or little boy is playing, girls, whatever.
Now, what's she doing?
Oh, she's, ah! (she's) she's reaching for the cookie.
Oh my gosh, on a--ah!—look, it's going to fall over.
Gosh, look, look--ah—look.

E: It looks that way.

S: Better grab the door, kid.
The cookie jar.
Got the top off.
(laughter)
And it looks like they could be twins.
But I think the girl is probably a year older.
Mother's doing the, drying the dishes.
Oh boy, something that occurs nearly every day when you have five boys.
(laughter)
I wonder, couldn't God have gotten it right and just stayed there?
(laughter)
Boys, boys, boys, boys.
Well, Anthony, Thomas, Jerome, Michael, Benjamin.
Now where are they?
Anthony's a doctor.
Tom writes up income tax, and stuff like that, you know.
Tom is blonde, and so's my dad.
But there are blondes in grandma's family, on the dad's side. (pause)

E: What else is going on in the picture?

S: Well, she's drying the dishes.
And there, he's up on his chair and is gonna fall over.
(laughter)
It's already a'tippin'.

And she's reaching for one.
She wants him to get one for her.
Oh brother.
He's gonna get hurt, maybe.
Bruised, at least (laughter).
(She, she) she presumably is unaware of what's going on. (laughter)
She'll know in a few minutes,
Won't she?

E: Oh, yeah.

S: When that stool> (laughter)
Mmm-mmm.
And the girl is reaching for that cookie that he's got in his hand.
And he's reaching for another.
Dad-gum, he's high, too (laughter).
Oh, he's gonna fall.
And there it looks like the water is spilling over on the floor.
Waaah!
She's there.
(unintelligible—volume. Comment re: "kids")
It looks like it's nice weather.
(Sh-she-) she's got the, no, (the window) the window looks like it's got the
curtains are drawn back.

Stage Six

E: Tell me a story about what's going on in that picture.

S: Well, let's see,
This mother is cooking the "*pluckards*" and is doing it very careful, of
course.
And, um, got the "*gamfummel*" of this "*gangkeepfire*" running over on the
big foot.
Now I don't know why she didn't know her feet wasn't in the wrong place.
(laughter)
I'm telling you, she was a little dumb.

E: Yeah, you'd think she's catch that.

S: You'd think that would have,
You'd think she would have seen, seeing and flying like that.
That this would have done better.
Now these two cooking.
Cookie jar is one that he wants to get.
She wants to get to give it by him.
Maybe she would do or maybe she would not do,
I don't know.
But I think it's kind of silly to make this "*alekshur*" because it really is.
You know,

I think that she would seldom stand that feet that's in that feet that's being undone.

I mean,

It's a good idea,

But (it) it would be a little nicer if it wasn't quite> (pause)

E: Yeah, I think it would be better if the sink wasn't going over. Yeah, I agree with that.

Stage Seven

E: Tell me a story about that. <points to picture>

S: Well, looks like a "*kaze*"

"*nedud*" after the mother, the second one was.

(3 s pause) The children will do that.

The cookie jar.

Any room.

House.

E: Thanks.

APPENDIX F

IRB APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 04-25-97   IRB#: AS-97-064

Proposal Title: A LONGITUDINAL STUDY OF DISCOURSE IN ADULTS WITH ALZHEIMER'S DISEASE

Principal Investigator(s):   Nancy E. Monroe, Cheryl M. Scott, Connie Stout, Tonya A. Wong

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature: Date: May 9, 1997
                Chair of Institutional Review Board
cc: Tonya A. Wong

VITA

Tonya Ann Wong

Candidate for the Degree of

Master of Arts

Thesis: A LONGITUDINAL STUDY OF DISCOURSE IN ADULTS WITH ALZHEIMER'S DISEASE

Major Field: Speech Pathology

Biographical:

    Personal Data: Born in Russellville, Arkansas, on March 3, 1974, the daughter of L. Keith and Cathy A. Baldridge.

    Education: Graduated as Salutatorian from Okmulgee High School, Okmulgee, Oklahoma, in May, 1992; received Bachelor of Science degree in Communication Sciences and Disorders (minor in Psychology) from the University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma in May, 1996 (graduated with distinction). Completed the requirements for the Master of Arts degree with a major in Speech-Language Pathology in December, 1998.

    Experience: Employed as a Habilitative Training Specialist during junior year in college; completed externships at Deer Creek Public Schools in Edmond, Oklahoma, and HealthSouth Rehabilitation Hospital in Oklahoma City, Oklahoma.

    Professional Membership: National Student Speech-Language-Hearing Association.