Order Number 9020754

Influence of structure on the content of oral narrative in adults with dementia of the Alzheimer's type

Ehrlich, Jonathan Steven, Ph.D.

City University of New York, 1990

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

4

INFLUENCE OF STRUCTURE ON THE CONTENT OF ORAL NARRATIVE IN ADULTS WITH DEMENTIA OF THE ALZHEIMER'S TYPE

by

JONATHAN S. EHRLICH

A dissertation submitted to the Graduate Faculty in Speech & Hearing Sciences in partial fulfillment of the requirement for the degree of Doctor of Philosophy, The City University of New York

1990

This manuscript has been read and accepted for the Graduate Faculty in Speech & Hearing Sciences in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

23 January 1990
Date

Lorraine K. Obler
Chair of Examining Committee

January 23, 1990
Date

Irving Hurwitz
Executive Officer

Lynne Clark, Ph. D

Louis Gerstman, Ph. D

Supervisory Committee

The City University of New York

Abstract

INFLUENCE OF STRUCTURE ON THE CONTENT OF ORAL NARRATIVE
IN ADULTS WITH DEMENTIA OF THE ALZHEIMER'S TYPE
by
Jonathan S. Ehrlich

Adviser: Professor Loraine K. Obler

The narrative production of adults with probable dementia of Alzheimer's type (DAT) was investigated in order to determine the extent to which cognitive or linguistic deficits explain the breakdown of discourse production. The structure of narrative tasks was manipulated such that the relationships among task structure and language production corresponded to predictions about the suspected origin of deficit. Sixteen DAT and 16 normal control subjects were administered four narrative tasks that were controlled for the amount of content and picture format display. Overall, the DAT subjects provided reduced content in terms of propositions and lexical items, shorter sentence length and more sentence fragments and reference errors

than the controls. The mode of picture display influenced neither the amount of target content nor the grammatical performance. In contrast, the amount of information pictorially represented significantly influenced the content provided by the DAT adults such that relative to the normal controls they performed better when the message to be related contained relatively less information. These findings support the contributions of both semantic-lexical and ideational systems to narrative discourse production.

Acknowledgements

I am indebted to many individuals for their assistance in all stages of this study. I first wish to thank the faculty and students who participated in the Dissertation Seminar for helping to mobilize my thinking in the early conceptual development of this research and providing useful suggestions. Dr. Loraine Obler has been a mentor in the fullest sense of the word. She has nurtured my intellectual growth and patiently guided me through a maze of complex issues and arguments. Her boundless energy and wide scope of vision were rich sources of support throughout my doctoral program. Dr. Obler's clarity of thought and precise use of language have taught me to appreciate elegance.

I am grateful to Dr. Louis Gerstman for his assistance in planning the research design of this study as well as his generous donation of time and energy towards the statistical analyses. I also wish to thank Dr. Lynne Clark for encouraging me to expand and clarify the findings of this study. Her valuable suggestions helped to strengthen this research. I also would like to acknowledge the perceptive criticism and suggestions of Dr. Audrey Holland. Special thanks go to Rachel Berman for her assistance in the scoring. My thanks also go out to Jan Dunn and Dr. Wilma Rosen for their technical advice and critical feedback. Drs. Haikaz Grigorian, Andrew Coyne, Christopher Randolf and the staff of COPSA were instrumental in helping me locate subjects and facilitate data collection. I am also indebted to all the subjects

who participated in this study. I must acknowledge how fortunate to have my family and friends who supported me in this endeavor. My parents were an unfailing source of encouragement. My wonderful children Joshua and Yosefa also deserve credit for allowing me the time to engage in this work; more importantly, their enthusiasm and eagerness for learning touched and re-charged my efforts. Rachel, my wife, has been helpful in too many ways for me to detail here. Her love and faith have sustained my efforts. Finally, I thank G-d for reaching the completion of this task.

Table of Contents

INTRODUCTION

Introduction

The language abilities of adults with dementia of Alzheimer's type (DAT) have come under increasing scrutiny in the cognitive neurosciences. The bulk of research to date suggests that language skills deteriorate in DAT over time in a characteristic manner with semantic and some pragmatic aspects of language far more vulnerable to impairment than syntax and phonology. Most studies have addressed issues of semantic-lexical processing, and have not focused on discourse, or language that extends beyond the sentence level.

The language production deficits in DAT adults show several consistent features and patterns. This clinical picture includes semantic paraphasias (Bayles, 1982), a reduced vocabulary (Hier, et al., 1985), a marked deficit on confrontation naming (Martin & Fedio, 1983), and repetitiveness, tangentiality, and the use of indefinite terms in discourse (Horner, et al., 1983; Obler, 1983). There is also growing evidence that syntax and phonology are relatively more preserved than semantic and lexical components of language (Irigaray, 1973; Whitaker, 1976; Schwartz, Marin & Saffran, 1979; Bayles & Boone, 1982; Obler, 1983; Kempler, Curtiss, & Jackson, 1987). The literature further documents resemblances to anomic

aphasia (Hier, et al., 1985; Nicholas, et al., 1985) in the early stages of DAT and Wernicke's and transcortical sensory aphasia in more advanced stages (Appell, et al., 1982; Murdoch, et al.., 1987). These findings help support the case for inclusion of language deficits into the diagnostic criteria of dementia (Bayles, 1982; Cummings, et al., 1985).

The study of the language functions of DAT adults has been fueled in part by the knowledge that the behavioral pathology associated with cerebral dysfunction can reveal the workings of the normal state. Thus, the language deficits of DAT can be viewed as a source of evidence about the relationship between nonlinguistic cognitive abilities (e.g. attention, memory) and language processing (Obler, 1981; Obler, 1983). Obler (1983), for example, claims that a semantic deficit underlies the lack of specificity in lexical selection and the semantic misuse of syntactic items that carry more semantic burden (e.g. "before", "because").

Bayles and Kaszniak (1987) define dementia as "... a condition of chronic progressive deterioration in intellect, personality, and communicative functioning..."(p. 1). They interpret the language data within a framework of information processing and memory, and suggest that decreased ideation is at the heart of dementia. Semantic memory, which forms part of the "central" or nonmodular system, consists of "knowledge of the world abstractly coded" and inferential processes. Semantic memory has a

characteristic breakdown in dementia according to this interpretation. They claim that a progressive impairment to the contents and processes of semantic memory accounts for the communication impairment in DAT. *Semantic memory* as used here should be distinguished from the more narrow sense of *semantic processing* cited by Obler. Semantic memory incorporates language and non-language knowledge, while semantic processing relates to linguistic knowledge of meaning and reference.

The neuropathology in DAT, relative to a focal lesion, is diffuse and includes neurofibrillary tangles, neuritic plaques, granulovacuolar degeneration, and brain atrophy; this pathology often involves the temporal lobes and hippocampal structures. The study of the language deterioration of DAT adults may eventually provide support for different neural models of language organization in the brain.

Literature Review

Discourse abilities of adults with acquired cerebral pathology have come under closer examination in the last decade. Discourse can be defined here as naturally occurring language that extends beyond the sentence level or across sentences. As a field of topic, discourse has only recently received systematic study in normal and abnormal communication. This review will broadly consider the discourse of brain-damaged adults and then focus on

narrative discourse, which is one genre of discourse. Narrative is a unit of language consisting of several propositions which collectively represent one or more events as in a story. This form of discourse is distinguished from conversational discourse or dialogue.

The application of discourse study to adult neurogenic communication disorders begins with aphasia. Studies of the comprehension and production of discourse in aphasia (Ulatowska, et al., 1981; 1983; Gleason, et al., 1980; Stachowiak, 1977; Yorkston & Beukelman, 1980; Nicholas, et al., 1985) support the claim that the global features of discourse organization are relatively more preserved in aphasia than the linguistic components such as lexical and syntactic processing. Ulatowska and her colleagues, for example, examine discourse production in all sorts of aphasia; they argue that cohesion, or the surface connectivity of a text, is disrupted to a greater degree than a text's coherence, or its conceptual structure.

Discourse study has also been applied to other cerebrally involved adults. Although far from homogeneous, the narratives of right brain damaged adults contain overall lowered informative content and less inferred content than those of normals (Joanette, et al., 1986). Traumatically head-injured adults, who are fairly early in their recovery process, produce fewer meaningful words, more inaccurate content, and increased hesitation phenomena such as fillers, revisions, and repetitions in their discourse

(Wyckoff, 1984). Mentis & Prutting (1987) found reduced cohesion in the narratives of head-injured adults; and Ehrlich (1988) reported reduced efficiency of communication or a slower rate of imparting information in head-injured adults in the later stages of recovery.

In recent years, researchers and clinicians have recognized the important role which pragmatic or extralinguistic contextual variables play in normal and pathological communication behavior. The analysis of discourse production, which as a task is close to naturalistic communication, is thus gaining support as clinically relevant for brain damaged adults. For example, Davis and Wilcox (1985) offer an interactive model of aphasia rehabilitation based on a pragmatic orientation in which conversational abilities are fostered.

The discourse abilities in DAT adults deteriorate in a characteristic way (Irigaray, 1973; Obler, 1981; Horner, et al., 1982; Bayles, et al.,1986; Hier, et al., 1985; Nicholas, et al., 1985). The discourse production of DAT adults may be marked by fewer substantives, more circumlocutions and digressions from the topic. This profile of "empty" discourse, is also characteristically egocentric and concrete with ideational perseverations, and press of speech or little or no speech in the late stages. Several stages of discourse changes (Horner, et al., 1982; Obler, 1983) have been identified. In early stages of DAT, a mild discourse deficit occurs with elaborate speech, occasional

repetition of ideas although discourse generally remains on topic; there is also a mild word finding difficulty and responses to questions are not precise. In the middle stages of the disease, a moderate deficit in discourse evolves into more frequent repetition and revision of ideas, paragrammatisms, a decrease in the amount of information relative to the amount of talk, and more self referential comments. At the late stages of DAT, more severe deficits in discourse emerge. The connected language of DAT adults becomes increasingly cluttered with repetitions, revisions, and intrusions. There is further reduction in the number of ideas expressed as well as increased difficulty maintaining a stream of thought. A decreased mean length of utterance and excessive speech or failure to initiate talk are also characteristic of the later stages of DAT. Finally, there is also violation of turn-taking rules in conversation.

Several recent studies focus on narrative discourse abilities in DAT adults. Shekim & La Pointe (1984) attempt to "quantitatively describe aspects of discourse" of 9 DAT and 9 normal adults through several elicited narrative discourses: picture-story description, telling a memorable story, expository or subject oriented discourse, and procedural discourse or telling how something is done. They looked at cohesion, based on Halliday & Hasan's (1976) system, performance deviations (e.g. incomplete utterances), length of communication unit or CU, which is identical to Loban's (1976)

T-unit, rate of speech, and percentage of maze words. A maze was defined as a series of words (or initial parts of words) or unattached fragments which do not constitute a communication unit. The DAT adults were found to have fewer cohesive ties per CU, more exophora or references to information outside of the text, more performance deviations, slower speech rate, and more maze words. The length of CU when mazes were removed was not significantly different for groups. Speech rate correlated negatively with the severity of dementia and the percentage of maze words correlated positively with the duration of dementia.

Santo Pietro and Berman (1984) examined the narrative discourse of a group of institutionalized elderly adults with and without senile dementia. Subjects were categorized on the basis of their performance on the Mental Status Questionnaire (Kahn, 1960) into severe, moderate, mild or no impairment groups, which included a sample of 8 men and 64 women with a mean age of 82.8. The "Cookie Theft" picture description task from the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983) was administered and Yorkston and Beukelman's (1980) content analysis procedure was used to quantify the amount and efficiency of information imparted. They reported significant differences in the number of content units only between the severe and no impairment groups. Not surprisingly, high negative correlations were noted between the amount of content and

efficiency measures and the severity of dementia. However, unlike in the study of Shekim and La Pointe, syllables per minute or speech rate did not significantly differentiate among the groups. Overall, the more demented subjects conveyed less meaning than the unimpaired subjects. Santo Pietro and Berman (1984) also noted the presence of more egocentric references, fillers, and non-specific words in the narratives of the demented subjects.

Hier, Hagenlocker and Shindler (1985) also used the "Cookie Theft" picture description task along with other language measures in their study comparing the language production abilities of adults with Alzheimer's disease, stroke related dementia (SRD), and normal controls. While subject selection was more careful in respect to etiology than in Santo Pietro and Berman (1984), the influence of age was not controlled. DAT adults were significantly older than the SRD subjects, and no exact age data were reported for the healthy controls except that they were older than 59. Hier and his colleagues measured a broad range of language variables from the elicited discourses which included: number of words, number of unique words, mean length of utterance, percentage of prepositional phrases and subordinate clauses, empty words, palilalia, phrasal perseveration, information units drawn from the picture content, and sentence fragments. They found reductions in all language variables, although lexical deficits were more pronounced than syntactic ones. All demented subjects, in the

picture description task, used fewer total and unique words, fewer prepositional phrases and subordinate clauses, more sentence fragments, and fewer relevant observations of the narrative content than the controls. DAT subjects in the early stages were found to resemble Anomic aphasics, and in the more advanced stages, presented as Wernicke's and Transcortical sensory aphasics. Hier, et al. relate this later finding to a dissolution of the "mental lexicon". They also considered the decrease in relevant observations to reflect a general intellectual decline rather than a disorder specific to language. Similarly, they attributed aposiopesis (interruption of sentences in midsentence) to a non-linguistic deficit in that "the dementia subject fails to perceive a necessity to complete utterances" (p. 128).

Beeson, et al., (1987) elicited picture description narratives from 15 mild DAT patients (3.7 on the Global Deterioration Scale), 20 moderate DAT patients (5.5. on the GDS), 15 fluent and non-fluent aphasics, and 26 normal elderly controls. Two Rockwell pictures ("Easter Morning" and "The Homecoming") served as the stimuli and response measures included: the number of words, number of information units (new relevant pieces of information), and story content which was further scored for 12 observations concerning setting (character, time, or place), events (action or state), and gist (theme), with 6 of the 12 observations considered "inferential" by the researchers. Only the moderate DAT and non-fluent

aphasic groups had significantly fewer words in their narratives than the mild DAT, fluent aphasic and normal control subjects; however, there were significantly fewer information units for the mild and moderate DAT and the non-fluent groups than for the control and the fluent aphasic groups. There were fewer event than setting observations for the disorder groups, and fewer gist and inferential observations for the mild DAT, non-fluent aphasic, and moderate DAT groups. Similar to the Shekim & La Pointe results, mental status correlated highly with the content measures which Beeson, et al. claim reflects "the cognitive demands of the narrative task". Beeson and her colleagues conclude that information units are sensitive measures to group differences.

Ripich and Terrell (1988) examined selected discourse features in the language production of six senile DAT and six normal elderly adults. Samples of dialogic discourse were elicited through topic-directed interviews and analyzed for the number of words, amount of turntaking, patterns of propositional forms (complete, incomplete, or nonpropositions), cohesion (appropriate and inappropriate), and the listener perceptions of the coherence or plausibility of the propositions. The DAT adults were found to use many more words and conversational turns than the elderly controls. The number of propositions (proposition was defined as an argument plus its relations) did not statistically differentiate between the DAT and normal

adults, although the DAT adults had a higher percentage of incomplete propositions (e.g. "My husband he had a...we were there"). Similarly, inappropriate use of cohesion was higher in the DAT group, but not statistically significant. The omission of a referent as in the example just cited was a more common error for the DAT adults. Trained listeners judged the discourses of all subjects for incoherence or inappropriateness and found no such instances in the normal adults' discourses; a total of 11 out of 1733 propositions of the DAT adults were found to be incoherent. The authors do not cite any statistical differences between groups for this variable. However, they state that multiple influences may be involved in coherent discourse; they suggest that the speaker's ability to take the perspective of the listener as well as the listener's ability to predict the speaker's message are essential ingredients to discourse coherence. They speculate that "The missing elements in the speech of SDAT patients may reflect a breakdown in a process of discourse, namely the ability of the speaker to take the perspective of the listener" (p. 14).

Ulatowska, et al. (1988) investigated the discourse performance of DAT adults across a range of tasks such as retelling a story, detailing a procedure, describing a pictured story, and providing a summary. The DAT subjects relative to the normal controls were more prone to include fewer target propositions in the picture story task and more irrelevant steps in the

procedures; they also produced more incomplete sentences and showed an abundance of reference errors such as a higher proportion of pronouns to nouns and more demonstratives or deictic terms. However, there were no differences in the amount of language produced, which was described in terms of T-units, length of T-units and clauses. The DAT subjects also included the essential superstructural elements to the story tasks e.g. setting, participants. Also, similar to the findings of Ripich and Terrell (1988) a group of listeners was not able to discriminate the DAT from normal subjects.

Recently, Smith, et al. (1989) used a picture story task to examine a group of 18 DAT subjects in their semantic and syntactic abilities. These subjects, who had a mean age of 82.5 years, were considered to be in the moderate to moderate-severe stages of dementia. Subjects described the picture from the Western Aphasia Battery and a Yorkston and Beukelman (1980) analysis of narrative content was applied. The DAT subjects were found to use shorter phrases and required more time to impart the target information in the picture story; that is they were less efficient than the normal controls. However, there were no significant group differences for the number of content units or target substantives, syllables, and the syllables/minute index. According to the authors, this somewhat unexpected finding that the DAT subjects provided the same amount of information as

the normal controls is related to the complexity of the picture stimulus. Smith, et al. suggest that picture story tasks "that require a holistic integration of linguistic and nonlinguistic information at the conceptual or message level representation" (p. 539) would be more difficult for the DAT adults than picture stimuli that depict details and events which are not necessarily integrated. The more complex stimuli should result in reduced content for DAT adults. They also claim that DAT adults are impaired in their ability to map "functional structure roles at an appropriately complex phrasal level" (p. 540).

Taken together, these studies show several consistent features of narrative discourse deviations for DAT adults. Across a range of tasks such as describing a picture, telling how to do something, and talking about a topic, the DAT adults show limitations in the use of cohesion and expression of content. Their discourses contain more exophora, or references to information outside of the text, more mazes or sentence fragments, fewer uniques words, and less syntactic complexity when compared with the discourse of the normal elderly. An increase in the number of words was reported only in the topic oriented discourses of DAT adults (Ripich & Terrell, 1988). The volume of discourse produced may be task dependent.

Some methodological problems regarding the study of the discourse of dementia can now be considered. Many of the above applied discourse

studies are descriptive and lack experimental control. For example, memory difficulty, one of the hallmarks of DAT, is not controlled for in Bayles (1982), in which a story retelling task was used. Shekim & La Pointe (1984) also use several memory-laden tasks, such as telling a memorable story. The amount and complexity of information in the picture stimuli is also not well controlled. Although Beeson, et al., (1987) come closest to specifying the amount of content in their narrative tasks, they do not directly manipulate this variable. Finally, there are often too many dependent variables reported, as in Shekim and La Pointe, Hier, et al., and Ripich and Terrell to allow valid inferences. Since multiple comparisons are made, the likelihood of finding differences due to chance is increased. Perhaps, the use of more stringent p values or other corrective procedures would improve the validity.

Another problem in discourse study is the low reliability engendered by using too few narrative tasks. Since there is much inter- and intra-subject variation in discourse production, the behaviors being measured should show some consistency. There also may be some question about the accuracy of the diagnosis of DAT. The diagnostic criteria for probable Alzheimer's dementia as suggested by the NINCDS-ADRDA Work Group (McKhann, et al., 1984) are not always explicitly followed. Consequently, subjects displaying more focal neurological deficits such as those found in

multi-infarct dementia as well as other dementing conditions may cloud the picture of language deterioration in DAT.

Rationale for Research in Discourse of DAT Adults

Some basic issues confronting the study of the discourse of dementia have been identified. Changes in discourse production such as digressions from the topic and ideational perseveration have long been considered by many researchers and clinicians to be reliable features in the communicative pathology of DAT adults. A review of recent research centering on the narrative discourse abilities of DAT adults reveals a reduced ability to convey meaning and make relevant observations; more non-specific words and fewer unique words are produced in oral narrative tasks such as describing a picture. While there is general agreement concerning the occurrence of these characteristics in DAT adults, an explanation of these narrative features in terms of the linguistic and cognitive deficits in DAT is lacking.

One of the basic issues confronting this research is determining where the breakdown of connected language in DAT occurs. Is it possible to transcend this descriptional level of "empty speech" and approach an explanation of narrative discourse deficit? Locating the origin or origins of

such a narrative production deficit would shed light on the linguistic and general cognitive processes involved in the production of connected language.

Such an area of research is not without obstacles. Even a more constrained form of discourse than conversation, such as a monologic narrative in describing a picture, involves the integration of visuo-perceptual information, ideas, concepts, schemas, communicative goals, and conceptual to linguistic mapping. The question of determining the relative contribution of each of these component processes in discourse as well as their inter-relationships at first glance may appear overwhelmingly complex given the enormity of the behavioral function of discourse. Furthermore, there is no consensus among researchers on the critical components of narrative discourse. Discourse analysis draws from a large field of models (e.g. Halliday & Hassan, 1976; de Beaugrande, 1980).

The "shotgun" approach, in which many arbitrarily different narrative tasks are administered along with a wealth of discourse measures, may be considered of limited value. The problem of specifying the loci of narrative deficit in the language of dementia should be amenable to experimental control by manipulating the characteristics of the narrative tasks. That is, systematically varying the conceptual and propositional structure of the narrative stimuli should permit a clearer view of where the breakdown in

connected language occurs for the demented adult.

The usefulness of research on demented discourse is well supported on theoretical and clinical grounds. Any knowledge of the loci of narrative deficit may inform a model of normative narrative production and may shed light on the relationship between more narrowly defined linguistic processes and nonlinguistic cognitive capacities. Furthermore, this knowledge may also suggest therapeutic principles for professionals and paraprofessionals working with DAT patients and their families. Rehabilitation techniques frequently emerge from a clearer understanding of the disorder.

Research Questions

It is possible to discern two separate explanations to account for the narrative deficits of DAT adults, namely, one of a semantic breakdown and one of an ideational impairment. These two candidates for narrative dysfunction, which may also coexist in the demented adult, are sketched here to help clarify the issue of connected language breakdown in DAT. Ample evidence is available to claim that a primary **semantic** impairment is responsible for the lack of adequate reference that characterizes much of the narrative production of DAT adults. That is, a difficulty located at the stage of conceptual to linguistic mapping may disrupt the content of the narrative. Alternatively, a more general **ideational** impairment may disturb the

conceptual organization of the message to be communicated. As used here, ideation may incorporate the executive functions of goal formation and planning. That is, ideation corresponds to the stage of discourse planning in which the speaker formulates a scheme to attain the goal of the message. This stage, which is close to Garrett's (1980) "message level" representation, operates autonomously from linguistic mapping.

The main purpose of this study is to examine the merits of these two claims concerning the loci of narrative deficit occurring in the language of DAT adults. Each claim yields a prediction about the relationship between narrative task structure and language performance in DAT adults; the differences between a semantic and ideational impairment may emerge by manipulating the characteristics of the narrative tasks i.e. systematically varying the conceptual structure of the narrative stimuli. Each hypothesis relating to the differential role of narrative structure on the connected language abilities of DAT adults is described below.

If a **semantic** deficit alone is held responsible for the language decline in DAT adults, then the capacity for semantic-lexical reference should be restricted whether the narrative task contains more or less propositional content; that is, the content actually produced in a picture description task should be proportional to the amount of information pictorially displayed. For example, the DAT adult who provided 70% of the information in a

shorter narrative task would be expected to provide roughly 70% of the information in a lengthier narrative task. Given this prediction, the language declines should *not* be sensitive to the narrative task that manipulates the amount of content.

Alternatively, an **ideational** impairment should be sensitive to the narrative task structure or the message to be communicated. Given this explanation, a more selective narrative impairment can be predicted in which the performance on the more informationally packed narrative stimuli would suffer to a greater extent. Given this type of impairment, for example, the DAT adult who produced 70% of the content in a less loaded narrative might be expected to produce only 50% of the information in a more loaded narrative. This would demonstrate that narrative production of the DAT adult represents more than a semantic-lexical impairment, and must consider the informational structure of the message to be communicated.

This research also considers the influence of the mode of pictorial display on the narrative performance of the DAT adults i.e. one picture compared with a sequence of three pictures and controlling for the amount of content. The three picture condition distributes the same amount of information over a broader display. Given a semantic limitation, the performance should be equivalent between the two conditions, or not influenced by the task structure. In contrast, given an ideational

impairment, a more task-specific effect with increased informational content in the single picture format for the DAT adult would be expected. The relatively poorer performance on the multiple picture format would result from the need to integrate more visual information since the stimuli are constructed with limited redundancy. The single picture which represents the entire narrative should reduce the processing load and facilitate the content organization. This would further reflect the importance of narrative stimulus structure and support the primacy of message level organization in narrative production as compared to strictly semantic-lexical capacity.

The main research questions posed here are:

1. Are the characteristic of narrative production of DAT adults in this study similar to those reported in the literature?

2. Does the amount of information or propositional content pictorially represented influence the relative amount of content provided by DAT adults?

3. Does the mode of pictorial display i.e. one picture compared with a sequence of three pictures influence the narrative performance?

4. What are the relationships among the amount of content provided by the DAT patients and the severity of dementia and language impairment?

a) Do parameters of task performance worsen as severity of dementia increases?

b) Does narrative performance relate to other component language skills and the presence of aphasia?

METHODS

Subjects

Sixteen DAT subjects were selected according to the NINCDS-ADRDA Work Group's (McKhann, et al., 1984) criteria for probable DAT: performance on a dementia rating scale, deficits in two or more areas of cognition, progressive worsening of memory and other cognitive functions, no disturbances of consciousness, onset between 40 and 90 years of age, and absence of systemic disease and depression. The severity of dementia was scaled through use of the Mini-Mental State examination (MMS) (Folstein, et al., 1975) and an adaptation (Fuld, 1978) of the Information-Concentration-Memory test (ICM) of Blessed, et al. (1968). Twelve of the DAT subjects were involved in a part-time treatment program to slow the decline of behavioral functioning. All experimental subjects received a full neurological evaluation within one year of the testing and were diagnosed with probable DAT by a group of physicians based on clinical, laboratory, and radiographic tests. All subjects showing evidence of focal neurological deficits or history of neurological or psychiatric illness were excluded from the study.

All subjects were native speakers of English and living in the

community; they also had at least a 6th grade education, and demonstrated adequate vision and hearing. The stringent exclusionary criteria for subject selection required rejection of many potential subjects. At least one hundred potential subjects failed to meet these entrance criteria. The majority of these were due to the presence of other complicating conditions e.g. alcohol abuse, hypertension. Also, more severely demented patients were unable to engage in the narrative task. Virtually all of the normal controls met the admission criteria.

There were 11 females and 5 males in the experimental group ranging in age from 64 to 92 years (Mean= 74.3; S.D.= 7.4). The mean number of years of education for the DAT subjects was 11.5 (S.D.= 2.6). The Mini-Mental State Examination (MMS), which was administered to 14 of the 16 DAT subjects and has a maximum score of 30, showed a mean score of 19.4 (S.D.= 4.6). The Information-Concentration-Memory test (ICM) administered to 13 of the 16 DAT subjects, yielded a mean error score of 14.8 (S.D.= 4.5) out of a possible 33 errors. The Western Aphasia Battery (WAB) (Kertesz, 1982) yielded aphasia quotients on 13 of the 16 DAT subjects ranging from 76 to 100 with a mean of 90.8 (S.D.= 7.8). Six of the 13 subjects obtained aphasia quotients that fell below the 93.8 aphasia cutoff; these six were all classified as Anomic based on the WAB criteria for aphasia subtypes.

A control group was tested (n=16) of age, sex, and education matched adults with no history of or current major neurological or psychiatric disorders. The control group consisted of 8 males and 8 females and had an age range of 65 to 83 (Mean= 73.2; S.D.= 5.3). Years of education for the control subjects was 11.8 (S.D.= 3.4). T-tests failed to show any group differences based on age and education, with T values of 0.50 and -0.24 respectively. The MMS was administered to 13 of the 16 control subjects and showed a mean score of 28.7 (S.D.= 1.0). As would have been expected, groups were found to differ significantly on this cognitive measure ($F=19.51$, $p< .0001$).

Procedure

All subjects were individually tested in a quiet area. Four separate narratives were elicited from each subject. Each subject was presented with either a single picture or three pictures which represent a narrative or several events, and instructed, "This picture tells a story. Please tell me everything you see going on in this picture". The instructions for the three picture format were, "These pictures tell a story. Please look at all of the pictures and tell me everything you see going on. Please start here". The examiner pointed sequentially to the three pictures, which were placed in

order, and then pointed to the first picture while giving the instructions. During the remainder of the task the examiner did not directly view the picture stimulus to encourage the subject to use as clear reference as possible. If the subject failed to respond or requested clarification about what is expected, the instructions were repeated once. Verbal cueing and reinforcement (e.g. "that's good, can you tell me anything else about what's happening here") was provided if the subject discontinued the task after fewer than three propositions. No other coaching during the task was given. When the subject concluded the narrative which was signaled by either a silence greater than 10 seconds or a verbal marker (e.g. "well, that's it", "I don't know what else there is"), one other verbal cue was provided, "Is there anything else that you see going on in the picture?" (or "pictures"). After the conclusion of the narrative, verbal reinforcement was offered to solicit cooperation for the next narrative stimuli to be presented. Instructions were repeated for each new set of narrative stimuli, "O.K., now please tell me everything you see going on here in *this* picture".

Prior to administration of the experimental narratives, all subjects were given a single picture training item. The "Cookie Theft" picture from the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983) was presented with the same instructions described above, but additional cueing

was given during the task to elicit sufficient information about the picture. All responses were audiotaped on a cassette tape recorder for all narratives. Finally, the language subtests of the WAB and the cognitive screening measures were administered to the DAT subjects at the time of this testing. In three cases the MMS was administered by a physician within one month prior to the testing.

Design

The complexity of narrative was manipulated along two dimensions in order to determine the influence of task structure on the narrative performance. The number of propositions was manipulated so that in condition (A), stimuli pictorially represent either 8 propositions or 12 propositions. A proposition, often considered a clause, is defined here as two concepts with a relation between them (Beaugrande, 1984). The 8-proposition texts contain approximately 28 information units, and the 12-proposition texts contain approximately 42 information units. An information unit corresponds to a substantive part of speech (e.g. noun, verb, adjective) which contributes novel information to the text.

In the second condition (B), either one single picture representing the

entire narrative or three separate pictures that combine to convey the information in the narrative, were presented. In the multiple picture format, the information was roughly equally distributed among the three pictures. For example, each sequence picture of the 12 proposition narrative represents four propositions. Combination of conditions (A) and (B) yielded four separate conditions: single picture/low content (SL), single picture/high content (SH), multiple pictures/low content (ML), and multiple pictures/high content (MH). Four distinct narratives were created and are titled here: Moving Day (1), Concert In Park (2), Buying A Car (3), and Making A Pie (4). All of these line drawings were done by the same artist. Each frame was approximately 7 inches by 8 inches. Each of these narratives was drawn in each of the four conditions: SL, SH, ML, and MH. The corresponding written narratives on which the artist based the drawings are in Appendix A. Several examples of the picture stimuli are in Appendix B.

Four separate narratives were elicited from each subject. A Latin square design was employed to control for any confounding of the conditions and the specific narratives as well as any presentation order effects for the four conditions and the four separate narratives. Thus, the first subject was presented with these stimuli: narrative #1-SL, narrative #2-SH, narrative #3-ML, and narrative #4-MH. The second subject was presented with:

narrative #4-SH, narrative #3-MH, narrative #2-SL, and narrative #1-ML. The full presentation order for 16 subjects is in Appendix C.

Transcription

All narrative samples were transcribed into standard English orthography in order to accurately compute the total number of words, the information units, and the number of target propositions produced for each narrative. Each narrative sample was initially segmented into utterances following Loban's (1976) notion of "communication unit". A communication unit, or C-unit, is considered an independent clause with all of its modifiers. Pauses occurring within C-units are indicated by a period in the written transcript; one period per one second of pause. The following criteria, adapted from Wyckoff (1984) and based on pilot analyses, were used in the text segmentation:

1. Place double slant lines (//) at the end of each C-unit (e.g. The family moved into the house//). As a minimum, a C-unit must include an independent clause.
2. Treat utterances that begin without explicit pronouns such as "looks like...", "seems to be a...", and "might be a..." as if the pronoun is included, and

thus as a C-unit.

3. Treat phrases without a copula (e.g. "these two children here", "the couple under the tree") as a C-unit when not joined to a preceding or following C-unit.

4. Place a single slant line (/) at the end of each clause within a C-unit.

5. Divide independent clauses joined by coordinating conjunctions (and, but, or) and introducers (then, so, unless) and count these forms as part of the second C-unit (e.g. the boy stood in front of the counter//and he cut some apples//).

6. Consider compound predicates as one C-unit (e.g. she sat in the car and examined the dashboard//).

7. Consider tag questions as part of the prior C-unit (e.g. That's a dog, isn't it?//).

8. Enclose sentence fragments, or those words which are extraneous to the C-unit, in brackets ([]). Fragments include:

a) false starts or revisions (e.g.[The boy began to]... the girl started to run//),

b) filled pauses (e.g. he paid the.[uh] man//),

c) immediate repetitions (e.g. this is [this is] some kind of chicken//), and

d) incomplete clauses resulting from a vacant obligatory object position

(e.g. [Each one has a...], [This is a.]). If the word or words add to the meaning of the C-unit, they are not considered as fragments (e.g. the men moved the furniture. the sofa down the ramp//).

9. Other statements extraneous to the narrative are enclosed in curved brackets () and not counted towards C-units. These may include self-referential utterances (e.g. (well, my son has a new car)), comments about the task (e.g. (that's about all there is to say), (this picture is a nice one), (in this second picture...)).

Scoring

1. The scoring of propositions was based upon either the whole C-unit or any phrasal or clausal components. Liberal criteria were adopted for propositional scoring since it was found in pilot testing of normal adults that there was much variation in the specific lexical items used. A proposition was scored correct if it was judged to convey the approximate conceptual relation of the target proposition form. Lexical criteria were provided to assist in the scoring. These two to three words provided for each proposition were darkened in the scoring guide texts (e.g. The two **children** (boy and girl) are **chasing** a **dog**.). However, substitution of an equivalent term received full credit towards the proposition (e.g. "the kids chased a dog", "the

boy and girl played with a dog"). Based on the control subjects' responses in the pilot study, several other target propositions were expanded to include alternative interpretations. For example, the first target proposition of the fourth narrative, "Making a Pie", is "A grandmother was demonstrating how to make a pie". Credit was also given for "A grandmother (or mother) was preparing a meal". Also, the picture representing "The grandmother told another girl to turn on the oven" yielded for several subjects a statement about the woman warning the girl to stay away from the oven. This alternate rendering was deemed acceptable. Pronouns were acceptable only when their referents were specified in any of the prior utterances. In each case, the darkened items or their equivalents needed be indicated to receive credit.

2. Information units were tallied based on a list of lexical target forms or their equivalents. Some adjustments were also made in the criteria for scoring information units based on the pilot work with normal subjects. For example, in the first narrative (Moving Day), "**empty house**" was considered an adequate equivalent for "**new house**".

3. The total number of words was tallied for each narrative. Contractions (e.g. "can't", could've") were considered as two words. Fragments and extraneous statements were not included in this count.

4. Measures of number of C-units, words per C-unit, and clauses per C-unit were computed.

5. A fragment index was computed by dividing the number of fragment words by the word total.

6. All deictic terms (e.g. "here", "this", "something") were tallied as instances of incompelete reference, and termed here as *indefinites*.

7. Pronouns without prior reference established were tallied separately as anaphora errors, or anaphora without reference.

8. Self-referential and extraneous statements were tallied separately and divided by the word total in order to gauge the tangentiality of discourse.

9. Finally, an efficiency index was computed by dividing the number of correct target propositions by the word total for the sample.

Inter-rater reliability of the scoring was determined for a quasi-random selected 10% of the narratives. A certified Speech-language Pathologist, trained in the above scoring procedures, independently scored 13 narratives. The results are shown in Appendix D. Inter-rater reliability quotients were greater than 80% for all of the variables except for anaphora without reference, which was only 70%. The bulk of disagreements in scoring anaphora without reference occurred for the first four scored narratives. After a two week hiatus, the second rater was requested to become more

familiar with both the specific narrative stories and scoring criteria and rescore the initial four narratives. The resultant reliability for anaphora without reference was 90%.

Analysis

The independent variables were group (DAT and normal controls), amount of propositional content visually displayed (low and high), and the mode of presentation (single and multiple pictures). An Analysis of Variance with repeated measures was employed to examine group differences at each condition. The main dependent variable was the amount of content in terms of target propositions; as well, measures of information units, indefinites, anaphora without reference, proportion of sentence fragments, extraneous statements and efficiency, and grammatical complexity (C-unit analysis) were included. Correlation matrices were generated for these narrative parameters and the linguistic and cognitive measures of the WAB, the ICM test and the MMS.

As described above, several predictions concerning the relationship between narrative structure and performance were tested. It was expected that DAT adults would perform more poorly than the control group on all

tasks. The DAT adults should show no differences among the four conditions if a semantic impairment is exclusively at fault. Given an ideational impairment, DAT adults, relative to normal control subjects, would be expected to perform better in the low content and single picture conditions. No interactions of content and format were foreseen for either hypothesis.

RESULTS

This chapter reports the results of the analyses of narrative production. Each narrative variable is separately considered for group differences between the DAT and normal control subjects, the effects of the amount of content and the format conditions on narrative performance, and any interactions. Finally, subject characteristics including gender and age are reported in their association with narrative production.

Target Propositions

The DAT and normal subjects were found to differ on the number of target propositions ($F=31.068$, $p< .001$). The DAT group provided a mean of 3.03 (S.D.=1.97) target propositions per narrative across all conditions; the normal controls averaged 6.31 (S.D.=1.29) target propositions per narrative. A main effect was found for the content condition ($F=35.288$, $p< .001$) with the low and high conditions yielding respectively low and high amounts of information in terms of target propositions for both groups. There were no significant differences in the number of target propositions for the format condition. That is, whether stimuli were presented on a single picture or multiple pictures, did not influence the number of target propositions for

both groups; there was no interaction between the content and format conditions. The means for all of the narrative variables for both DAT and normal control groups according to condition are in tables 1 and 2.

A significant Group by Content interaction ($F=5.767$, $p< .02$) was found which was examined further through post-hoc testing. The Scheffe test indicated significant differences ($p< .05$) between the low and high content conditions for the normals i.e. the normals provided more content in the high condition than in the less dense counterpart; for the DAT group, by contrast, the difference between high and low content conditions was not significant. Thus, relative to the normals, the DAT subjects provided relatively more content in the low as compared to the high content condition.

Information Units

There was a large group effect ($F=33.864$, $p< .001$) and content effect ($F=46.413$, $p< .001$) for the number of information units, or target substantive words in the narrative production. Similar to the findings reported for target propositions, the format condition had no influence on the number of information units. The DAT subjects averaged 9.60 (S.D.= 4.38) and the normals had a mean of 17.25 (S.D.= 2.90) information units across all conditions. There were no significant interactions for any of the

conditions.

Words

There were significant main effects for format ($F=15.617$, $p< .001$) and content ($F=7.802$, $p<.009$) for the total number of words per narrative. The multiple picture condition, yielded more words for both groups with a mean of 122 words than the single picture which averaged 100 words per narrative. Similarly, low and high content conditions produced relatively shorter and longer narratives for both groups, averaging 102 words in the low condition and 120 words in the high condition. Group differences fell short of the .05 level of significance ($F=2.943$, $p<.09$), but were in the direction of the DAT group producing shorter narratives than the normal controls. The mean number of words per narrative for the DAT group was 98.3 (S.D.=44.1) and for the controls was 123.7 (S.D.=39.7). These relatively large standard deviations point to much inter-subject variability in narrative length for both groups.

C-units

There were significant main effects for format ($F=18.182$, $p<.001$) and

content (F=15.006, p<.001) with respect to the number of communication units, each defined as an independent clause with all of its modifiers. The number of C-units did not significantly distinguish the DAT and control groups. Subjects provided approximately 14 C-units in the multiple picture and the high content conditions and 11 C-units in the single picture and low content conditions. There was, however, a significant Group by Content interaction (p<.034). As confirmed by the Scheffe' test (p<.05), the normal controls' narrative length in terms of C-units could not be differentiated by the content condition, whereas the DAT subjects produced relatively fewer C-units in the low compared to the high content condition. This contrasts with the findings of a significant group by content interaction for the variable of target propositions. That interactional effect showed that the demented subjects' production of target propositions was not differentiated by the content condition.

C-unit length

The average number of words per C-unit differed significantly for group with the DAT subjects providing shorter sentences than the normal controls (F=4.831, p=.036). There were no main effects for content and format conditions. However, the interaction of group with content was significant

($p<.01$). Post-hoc testing using the Duncan test ($p<.05$) showed that for DAT subjects the length of C-unit was influenced by the content condition, whereas the performance of the normal controls was not differentiated by the low and high content conditions. The average C-unit length for the DAT subjects was 8.11 in the low condition and 7.36 in the high condition.

Fragments

A significant main effect ($F=5.821$, $p<.023$) for group was noted for the fragment index, or the number of sentence fragment words divided by the word total for each narrative. The mean fragment index for the DAT subjects was .107 (S.D.=.104) and for the normal controls was .043 (S.D.=.016). The DAT group had more instances of sentence fragments in their narratives; and neither content nor format conditions were significant for this variable.

Indefinites

A significant main effect ($F=53.342$, $p<.001$) for group was noted for the index of indefinites (number of instances of deictic terms divided by word total). There was no main effect for either condition. The DAT group had a mean index of indefinites of .082 (S.D.=.034) and the normal controls

averaged .019 (S.D.=.009).

Efficiency

A significant group effect was found for efficiency index, i.e. the target propositions divided by the word total (F=23.610, p<.001). The mean efficiency index for DAT subjects across conditions was .031 (S.D.=.013); the normal controls averaged a significantly higher .057 (S.D.=.016). There were no content and format effects for this variable.

Clauses per C-unit

There were no significant effects for the number of clauses per C-unit for group, content, and format. The mean number of clauses per C-unit for the DAT subjects was 1.09 (S.D.= .074) and for the normal controls was 1.12 (S.D.= .116).

Anaphora without Reference

A group effect for anaphora, computed as an index or ratio of instances of anaphora without reference by the word total, just fell short of the .05 level of significance (F=3.798, p=.061). The DAT group had a mean anaphora index of .025 (S.D.=.019) and the normal controls averaged .013 (S.D.= .013).

Extraneous statements

There were no significant group (F=1.313, p=.261), content (F=.212, p>.5), or format (F=1.805, p<.19) effects for the number of extraneous statements per narrative. The DAT group had a mean index of extraneous statements of .25 (S.D.=.25) and the normal controls averaged .17 (S.D.=.12). Similar to the values for total words, there was much intersubject variability within groups for this measure of tangentiality.

Gender

The DAT and age-matched groups were not equally matched for gender with 11 females in the experimental groupof 16 subjects and 8 females in the control group of 16 subjects. Possible gender differences for narrative production were examined to ascertain that the differences between the DAT and normal subjects were not associated with possible male and female narrative production differences. In the normal group, there were no discernible differences between the females and males in the variables of age and education; the mean age for men was 75 and for women 72 (S.D.=5 for both). Mean years of education was 12 (S.D.= 2.8) for males and 11 (S.D.=2.4) for females. Target propositions and information units were

separately summed across the four conditions to compare the control males and females. The mean number of target propositions for females was 23.6 (S.D.=4.7) and for males was 26.9 (S.D.=5.4). The mean number of information units summed over the four narratives was 66.2 (S.D.=11.6) for females, and the males averaged 71.8 (S.D.=11.7). Although the males scored higher on both of these content measures, T-tests failed to reveal any gender differences for propositions and information units as well as the remaining variables of words, C-units, C-unit length, fragments, indefinites, efficiency, clauses, anaphora without reference and extraneous statements. The Mann-Whitney test found a gender difference ($p<.05$) only for efficiency. The mean efficiency indices were .05 for males and .06 for females; the normal males and females also showed incompatible variances for efficiency with the females having more variability ($z=2$) than the males. Thus, the finding of significant differences between DAT and normal controls for efficiency is weakened since gender differences may be associated with the group effect.

Correlations

Correlation matrices for DAT and normal subjects for the key variables are displayed in tables 3 through 6. The MMS and the ICM correlated highly

with each other (r=-0.76, p=.003) and to a lesser extent with the WAB (r=0.56, p<.05). The two cognitive measures and the WAB did not correlate with age and education for experimental subjects, which suggests that the severity of dementia and language dysfunctioning for these subjects was independent of age and education.

Performance on the WAB correlated significantly (p<.05) with all of the narrative variables except for clauses, indefinites, and extraneous statements. That is, this measure of language comprehension and production correlated with target propositions, information units, words, C-units, C-unit length, fragments, and anaphora without reference. The MMS and ICM correlated (p<.05) with target propositions, information units, total words, the number of C-units, fragments, extraneous statements, and efficiency. There was only one case of disagreement between the two cognitive measures which was in their relationship to anaphora; the ICM test correlated with anaphora without reference (p=.053) while the MMS showed less relationship (p=.218). There were no significant relationships noted for the clauses/C-unit and indefinites with the cognitive measures.

Age was negatively correlated with target propositions (r=-0.47, p=.035) such that older DAT subjects tended to provide less of the target content; the normal group similarly showed a negative correlation between age and

target propositions (r=-0.42, p=.055). Similar relationships between age and other measures of narrative production were found for the normal controls. Age correlated negatively with information units (r=-0.51, p=.02), fragments (r=0.50, p=.03), and extraneous statements (r=0.44, p=.05). In addition to providing less of the target narrative content, the more elderly subjects tended to have more instances of disruption in narrative production than the younger elderly.

The majority of inter-item correlations showed agreement between the DAT and normal subjects. Information units correlated ($p<.05$) with all of the narrative variables except clauses and fragments for the DAT subjects; whereas for the normal controls, the number of information units was associated with all but indefinites and extraneous statements. The word total correlated well with all narrative variables except for clauses, fragments, indefinites, and efficiency for DAT subjects. The normal controls showed a high negative correlation between the word total and efficiency such that a lot of words was associated with a lower efficiency or rate at which the content is imparted for the normal elderly. The number of clauses correlated with sentence or C-unit length for both groups. Finally, the index of sentence fragments was associated with anaphora without reference in the DAT group, and extraneous statements in the normal group.

DISCUSSION

Introduction

The results for group and condition differences can now be separately summarized and reviewed in light of the prior research on the narrative production of DAT subjects as well as the hypotheses underlying this current study. This chapter begins with a review of those features of narrative production that distinguished the DAT from normal control subjects; the relationships among narrative production and relevant subject characteristics are discussed in this context. The influence of the two conditions, namely amount of content and format display, on the narrative production is then addressed and related to possible explanations for the narrative dysfunction in DAT adults. Selected unresolved issues relating to narrative production and DAT adults are raised. Finally, several clinical applications and research implications growing out of this research will be discussed in the Conclusions chapter.

Group differences

Overall, DAT subjects produced narratives with less content than the normal control subjects as reflected by fewer target propositions and information units, and reduced efficiency. Demented subjects also showed structural differences in their connected language; they had shorter C-units

and more instances of indefinites and sentence fragments than the normals. DAT subjects also showed tendencies to have fewer words and more instances of anaphora without reference in their narratives, but these differences failed to reach significance. The measures of numbers of C-units, clauses, and extraneous statements were not useful for distinguishing the discourse of DAT subjects from normal age-matched peers.

The main finding of reduced content in the narratives of DAT subjects is in agreement with most prior studies (Santo Pietro & Berman, 1984; Hier, et al., 1985; Beeson, et al., 1987; Ulatowska, et al., 1988). The presence of increased numbers of sentence fragments, and indefinites in their narratives is also in accord with others (Hier, et al., 1985; Bayles & Kaszniak, 1987). The trend of DAT subjects to use fewer words in their narratives, while not significant, is consistent with Hier, et al., (1985) and Beeson, et al., (1987); however, Ulatowska (1988), reporting on a group of DAT subjects with a mean MMS score of 22, found no differences between them and age-matched normal controls for narrative length. As a point of comparison, the mean MMS score of the DAT subjects in this study was 19.4. These divergent findings in the literature concerning narrative length as well as the equivocal result in this study may be accounted for by both the type of narrative task used to elicit the narrative and the severity of the cognitive-linguistic impairment.

A similar discrepancy in the literature concerns utterance length. The

finding of shorter C-unit length for the DAT subjects in this study agrees with Hier, et al. (1985) and Smith, et al., (1989), but disagrees with Shekim & LaPointe (1984) and Ulatowska, et al., (1988). This disagreement in the literature concerning sentence length of DAT patients may also be related to the two above mentioned factors: the level of severity of dementia and the type of discourse task. Both the Shekim & LaPointe (1984) and Ulatowska, et al., (1988) studies used relatively early stage dementia patients who likely exhibited less linguistic pathology. Also, as argued by Smith, et al., (1989) and demonstrated in this study, the complexity of narrative task can influence the verbal production of DAT adults. Indeed, Shekim & LaPointe (1984) show production differences among various discourse tasks. Specifically, they found that narrative tasks that required telling an integrated story yielded longer sentences than procedural tasks (i.e. describing how something is done) and narrative tasks that detailed events not necessarily connected by an overarching theme. The narrative stimuli in this study required the generation of a story based on pictured events. One possibility is that the shorter C-unit length for DAT subjects may represent the use of a narrative strategy which is more procedural or list-like rather than subject oriented as in a well developed story. Alternately, reduced sentence length may point to decreased semantic and/or syntactic resources.

Ulatowska and her colleagues (1988) administered a broader range of narrative tasks, most of which involved a typical plot of several events

occurring over time; they found that while DAT subjects tended to show a full range of narrative superstructures (e.g. setting, action, resolution), they used relatively few complicating actions and resolutions. Similarly, Beeson, et al. (1987) found that DAT subjects produced fewer gist and inferential statements in their narrative production. The narrative stimuli in this current study involved several events occurring roughly at the same time. Although these narratives contained plots that entailed participants and actions, they did not have definitive or clear story endings that resolved a particular problem emerging from the actions of the story. Thus, production differences for DAT adults in these various studies may be partly a function of story complexity.

The narratives of DAT subjects were also distinguished from those of normal controls by more instances of sentence fragments and indefinites. These findings agree with Nicholas, et al. (1985) and Ulatowska, et al. (1988). Both of these measures showed relatively few inter-item correlations with the other narrative variables. Sentence fragments were far from homogeneous; they included partial word to phrasal repetitions and revisions and filler words. For example, in narrative #7 in Appendix E, "They're moving the fur.." was scored as a fragment because it was incomplete; the likelihood that the subject did intend "fur" is considered too remote since no similar error was found for any other subjects. Such an utterance may signify word finding difficulty. Similarly, the greater number

of deictic terms and indefinite nouns for DAT subjects, which was seen in the larger indefinites index, may indicate a word retrieval impairment. That is, unable to supply the target word, the DAT adult may provide a more general substitute term. Another plausible explanation for these findings is at the level of pragmatic knowledge (Ripich & Terrell, 1988). A disruption affecting the speaker's ability to appreciate the listener's needs might contribute to a relative abundance of incomplete sentences and unclear reference. These alternate explanations may also be collectively responsible for this pattern of narrative production seen in the DAT adults. The data from this study do not directly address these explanations.

The reduced efficiency scores for the DAT subjects indicate that they require more words than normal control subjects to convey their relatively fewer target propositions for a given narrative. The lack of conciseness in the narrative production of DAT subjects may be related to the "empty speech" characterization of demented discourse. Reduced efficiency for all subjects was associated with more reference errors or indefinites and extraneous statements. For the normal subjects, reduced efficiency was strongly associated with greater narrative length. The lack of association between efficiency and narrative length for the DAT subjects may be related to their marginally reduced narrative length relative to the normal control subjects. The efficiency measure in effect rewarded a more economical narrative style of providing the most information in the fewest necessary

words. One ingredient of "empty speech" may be ideational and/or linguistic perseveration. Examination of the narratives of both groups of subjects suggests more instances of repetition of parts of propositions as well as whole ones by the DAT subjects compared to the normal controls. A quantification of repetition was attempted in the pilot study, but found to be too unwieldy for this study. In the pilot work, partial repetitions and whole repetitions of target propositions overlapped and were not categorically scored.

The lack of group differences for extraneous statements was surprising since tangentiality has long been considered one of the symptoms of the discourse of demented subjects. DAT subjects showed no age-related correlations for extraneous statements. However, this measure was highly correlated with dementia severity and this study included several early stage DAT subjects with relatively mild impairments. For the normal subjects increasing age was associated with more extraneous remarks. It is reasonable to speculate that this measure would differentiate a more moderately impaired group of subjects from normals and possibly from a group of newly diagnosed DAT subjects. It is also possible that tangentiality in narrative production was operationally defined too narrowly for this study, which might have under-represented its presence. Extraneous statements were scored by the appearance of "I" in references to the picture, and reference to information considered explicitly outside of the story.

Other remarks tangentially related to the narrative was not scored as an extraneous statement. Both control and DAT subjects included in their narratives such content that was peripherally related to the stimulus story but did not meet the criteria for extraneous statements. A more sophisticated measure, which captures such borderline cases, could prove useful.

Influence of Age

The influence of age on narrative production yielded some unexpected results. As noted above, the older subjects of both groups tended to provide fewer of the target propositions and information units in their narratives. Obler (1980) found a similar tendency for older normal and DAT subjects in a story recall task; that is, the older normal as well as DAT subjects provided fewer information units. She suggested a memory factor to explain the difference. In this current study, memory was less at issue since picture stimuli were present throughout the task. It must be questioned why the more elderly have difficulty in supplying the necessary content to their narrative production. The older DAT subjects also were more limited in their efficiency than the younger DAT subjects; and the more elderly normal controls showed more sentence fragments and extraneous statements than younger controls. These decreases for both groups are not easily explained

by general cognitive limitations since age was not well correlated with either of the cognitive measures. Perhaps, more sensitive and comprehensive testing would yield a specific cognitive factor which can be tied to the developmental changes in narrative production.

The decrements associated with the older normal subjects also speak to the question of the nature of the dementing disease. Specifically, is DAT largely an acceleration of normal aging? The general picture of decline in narrative production of DAT subjects parallels that of the more elderly normal controls. Although not designed to directly examine the age effect, the results of this study suggest that this may be the case. Alternately, primary sensory changes known to occur in normal aging may play a role. Future investigations will undoubtedly need to tease apart the question of age and narrative production.

The subject variable of education did not surface as a point of influence in the narrative production of DAT subjects. None of the correlations between education and the narrative production of both groups were noteworthy. Also, as noted before, the absence of correspondence between education and the severity of dementia suggests that they are independent. This conclusion of the lack of influence of education may be weakened by the relatively narrow range in education.

The subject variable of gender was also not directly examined in this study for its possible influence on the narrative production of DAT adults.

The small number of male subjects in the experimental group precluded a comparison of gender differences among the DAT subjects. For the equally balanced normal subjects, there were no significant gender differences in the amount of content provided per narrative. However, the tendency for females to be more efficient than the males in providing target content, provokes questions about possible gender differences in narrative production. Perhaps a larger group would yield statistical differences between males and females.

Influence of narrative structure

The content and format conditions, which manipulated the stimulus structure of the narratives, produced several findings equally for both groups of subjects. The high content pictured narratives yielded more target propositions, information units, total words, and C-units. The content condition did not influence the primarily syntactic variables of C-unit length, clauses, sentence fragments, indefinites, anaphora without reference, extraneous statements and efficiency. Thus, while the content actually produced was roughly proportional to the amount of content presented in the narrative picture stimuli, the language structures were largely not responsive to the inclusion of more or less content.

The format condition, which held the amount of content as a constant and manipulated only the visual density of stimuli, was critical *only* for the

variables affecting the narrative length i.e. total words and number of C-units. A more expanded verbal output was stimulated for both the DAT and normal subjects by the larger area visual stimuli. Since the format condition did not influence any of the narrative variables other than length, it served as an additional experimental control for the content condition; that is, since the amount of information or target content actually produced was unrelated to the format of presentation, each subject in effect received two low content and two high content narrative tasks.

Ulatowska and Bond (1990) examined the narrative performance of DAT subjects on a sequential picture task with four and seven picture stimuli; these stimuli contained one episode per panel. The DAT subjects had more narrative disruption in the seven picture condition. However, this finding does not contradict the lack of influence for picture format display found in the current study. A comparison between these two studies is limited. Ulatowska and Bond did not control for the amount of content between the conditions and there were more than three pictures used. It is very likely that the seven picture condition entailed more content and more complexity.

Influence of Content Amount

Finally, we approach the main question of this research: does the amount of information or propositional content pictorially represented influence the relative amount of content provided by DAT adults? That is, what is the

relationship between target narrative structure and production for subject group. Specifically, the interplay between dementia and narrative conditions was examined to address the issue of location of narrative breakdown in DAT. The semantic-lexical view holds that additional structure in the narrative stimulus would not affect the production of DAT adults. The ideational position claims that stimulus structure will have a differential effect on the DAT subjects.

The format of picture display did not have any influence on the DAT subjects different from that on the normal controls. Whether the narrative presented was pictured on one picture or three pictures did not hinder or promote the narrative production of DAT subjects. The absence of significant findings for format and group is in agreement with the semantic-lexical position since the task structure did not influence the narrative content production. However, this interpretation of the influence of picture stimulus format needs to be approached cautiously. It is possible that the single and multiple picture formats both hold advantages and disadvantages which could nullify one another. For example, in the multiple picture condition, performance might be aided by the visual redundancy and at the same time worsened by the need to integrate visually separate stimuli. It is clear that the manipulation of picture format needs to be studied further before its role on narrative production can be better specified.

The main finding of this study is that compared to normal controls, the

DAT subjects conveyed relatively more content in the low content condition or less dense narrative. That is, they were able to provide relatively more target propositional content when the narrative stimulus was more simplified. This finding highlights a differential role played by narrative stimulus on the language production of DAT adults and is thus in accord with the ideational explanation of narrative dysfunction. That is, since the amount of content pictorially displayed influenced the amount of information that DAT subjects were able to provide, it is presumed that their particularly diminished narrative content in the high content condition points to impairment that extends beyond semantic-lexical processing and reflects to some extent an ideational impairment.

The DAT subjects also provided more C-units, but shorter length C-units, in the high content condition relative to normal controls. This latter result of apparently reduced sentence length in the more densely packed narratives of DAT subjects suggests that syntactic complexity is also affected by the narrative stimulus structure. Taken together, these results support the claim that ideation must reckon with the complexity of the message to be produced. According to this interpretation, the amount of ideation required affects both the relative amount of propositional content and the sentence structures generated by DAT subjects.

Another interaction between group and the low/high content condition emerged for the control group. The number of C-units, one measure

corresponding to narrative length, was not differentiated for the normal adults by the amount of target content. That is, the normal subjects produced a similar number of C-units for the low and high conditions. This contrasts with the measures of target propositions and information units which were differentially affected by the content condition. The normal adults produced target content proportional to the high/low condition. Moreover, the other variable of narrative length, total words, was distinguished by the content condition for the normal adults. It is unclear why the number of C-units remained fairly uniform across low and high content narrative conditions.

It may appear that support for the ideational deficit hypothesis in narrative production of DAT patients is weakened since there were no other interactions between group and conditions on all the other variables; that is, information units, total words, clauses, fragments, indefinites, anaphora without reference, extraneous statements, and efficiency were not affected by the interaction between DAT and the stimulus structure. Since these narrative variables were diminished across the board or more constant under all conditions, it is likely that they reflect integrity of the semantic-lexical system to a greater extent. That is, they are more strictly linguistic than the content measures of propositions and information units. The lack of influence of stimulus structure on these variables in conjunction with the overall lower scores of the DAT patients, however, might then seem

to provide legitimacy to the semantic deficit hypothesis of narrative dysfunction.

Some explanation for the apparent inconsistency in results regarding the influence of stimulus structure is necessary. The disagreement implied in the ideational and semantic deficit views might be resolved if it is assumed that different aspects of narrative production have different ideational and semantic components or inputs. One explanation for the narrative production deficit of DAT adults would suggest impairments to both ideational and semantic-lexical systems. The control of propositional content in narrative production may be determined at the ideational or message level at which higher order concepts such as propositions are formed. The linguistic forms generated would then be the responsibility of the semantic-lexical system.

Accordingly, narrative production relies on the contributions of ideational and semantic-lexical inputs. Ideation is responsible for formulating the communication goals of a message and translating it into a discourse plan. The ideational system is charged with planning out the message or what is to be communicated, and then forms and assembles propositional schema. The semantic-lexical system maps these propositional schema into linguistic structures. This proposed model presumes that discourse production can be broken down into at least two stages, the first involving planning, and the second, execution. The findings of this study

support such a division of labor. More empirical work is undoubtedly needed to fashion a more detailed model of discourse production.

CONCLUSIONS

This final chapter begins with a summary of the major research findings of this investigation in order to set the stage for a discussion of the theoretical implications and clinical applications. Methodological, theoretical, and future research issues relating to normal and pathological narrative production are addressed in the context of this study. Finally, several clinical applications which consider the diagnostic and therapeutic usefulness of discourse analysis techniques that were used in this study are discussed.

Summary of Findings

This work contributes to our knowledge about the language production and breakdown of adults with DAT. The findings, as summarized below, add to the research on cognitive-linguistic impairments of demented adults. The experimental manipulations of narrative stimulus structure have not been done previously. The experimental control of the amount of content in this research permits the conclusion that DAT adults show diminished content a higher degree of confidence than in prior studies. Further, the manipulation of picture stimulus display while controlling for content has not been previously attempted.

The overarching goal of this study was to go beyond the descriptive

characterizations of the narrative production of DAT adults and approach an explanation of the unraveling of this complex behavior. The two candidates for narrative dysfunction, namely semantic-lexical and ideational impairments, were isolated in this study by experimental manipulation of the narrative task structure. That is, these explanations about suspected deficits led to different predictions about the relationship between narrative task structure and the resulting language production. The semantic-lexical view predicted uniform and non-specific decreases in narrative performance across the conditions of changing stimulus structure, whereas the ideational view expected task dependent effects for the DAT adults. The main findings of this research are summarized here with this central question of culpability for narrative dysfunction kept in mind, in order to set the context for discussion of the implications of this study for further research.

1. The narrative production of DAT adults was characterized by diminished content in terms of propositional schema and information units, shorter sentence length, more sentence fragments, more reference errors, and more reduced efficiency than their age-matched normal peers. Most of these changes in narrative proficiency were noted to negatively correlate with age in the control group such that the more elderly normals performed worse than their younger normal peers.

2. The mode of pictorial display- whether the narrative was pictorially

represented on one or three separate pictures- did not influence the narrative performance of both groups in terms of the content and error measures; however, both DAT and normal adults consistently produced a greater volume of language in terms of words and C-units when presented with the multiple picture versions.

3. The amount of information which was pictorially represented *did* influence the amount of propositional content provided by DAT adults. Relative to the normal controls, the demented adults furnished relatively more content in the low content narrative condition. That is, they performed better when the message to be related contained relatively less information or was simplified. The DAT adults also used relatively longer C-units in the low content narrative versions.

4. The results support a dual deficit explanation for the narrative production breakdown in DAT adults. Both ideational and linguistic systems are implicated by the mixed findings of task-dependent and non-specific decrements in narrative production. These results suggest that the responsibility for planning and generating propositional schema is primarily ideational, whereas the semantic-lexical system maps these conceptual schema into linguistic forms.

In summary, this research goes beyond what has been previously reported in the literature concerning the connected language production of

DAT adults. The following conclusions are listed here to highlight that which is novel in this study:

1. DAT adults were influenced by the complexity of narrative task such that they provided relatively less content in more content-loaded stimuli.

2. DAT adults showed syntactic simplification in their narrative production relative to normal controls and showed greater reductions in the higher content stimuli.

3. DAT adults were not differentially affected by the picture format display.

4. DAT adults who were in the relatively early stages of the disease showed decrements in narrative production.

5. More elderly normal adults showed reductions in narrative production relative to their younger elderly peers such as reduced content and more structural errors i.e. indefinites and fragments.

Implications for Research

Implications for future research are raised here and discussed in both general and specific terms. Attention is first directed to methodological issues. This area of research would be enriched by continued refinement of discourse analysis. As discussed earlier, the techniques used for eliciting and

analyzing discourse as well as the models for understanding discourse vary widely. Improvement in the measurement techniques applied to discourse analysis would permit better descriptions of the phenomena in question. Issues concerning discourse breakdown in DAT can only be studied if the tools which examine it operate with precision and sophistication. Additionally, models of normal narrative production would be better informed by more precise measurement techniques.

Improved discourse analysis techniques might allow other sorts of experimental manipulation of narrative tasks and stimuli. For example, more subtle experimental control of narrative schema, goals and content might more unequivocally provide answers to the research questions posed here. Specifically, it would be helpful to replicate the finding of influence of message complexity on the narrative production of DAT adults using other measurement techniques and stimuli. That is, this finding would be strengthened if replicated with an independent tool, or different type of narrative production task. It might also prove useful to examine other possibly influential aspects of the narrative stimulus for DAT adults such as size of the stimuli and story structures. Perhaps, the addition of an orally presented narrative model would prove useful. Also, the effect of other types of visual stimuli (e.g. video) can be explored.

The question of determining where the breakdown of narrative

production occurs in DAT adults is not simply answered by these findings. Rather, these findings combine to point out different directions of influence, both semantic-lexical and ideational, that merge to produce the pattern of narrative discourse associated with DAT. It is argued that impairments to both ideational and semantic-lexical systems are responsible for the decrements in narrative production seen in DAT patients. The ideational system in normal narrative production converts a message into propositional schema, and the semantic-lexical system generates the linguistic forms corresponding to them. In DAT patients ideational and semantic-lexical deficits converge and limit narrative production.

As a deficit to the ideational or conceptual system is deemed responsible for part of the narrative production impairment of DAT adults, several questions emerge. It is unclear if this reduction in the conceptual arena represents a generalized or more selective impairment. That is, are different types of propositional content and schemas more vulnerable to disruption than others? For example, the more abstract propositions such as those that represent an overarching theme or motivation within a story may be more difficult for DAT adults than those propositions that provide isolated details about the setting. Or perhaps, a more general limitation of processing capacity curtails the organization and segmentation of the message into propositions if it exceeds a given amount.

It is also far from clear how ideational and semantic-lexical systems interact during narrative production. It is reasonable to expect that these two systems operate interdependently in connected language production. The unearthing of the interplay between cognitive and linguistic processes which underlie narrative production represents a long term goal in neurolinguistic investigations of the language of DAT adults.

This study also provokes several questions concerning the developmental characteristics of narrative production. It must be questioned why discourse performance worsened for the more elderly normals. Longitudinal study of the narrative production of normal and DAT adults using group and single-case experimental designs would be beneficial in this regard. Such research should also exercise greater control over primary sensory processes such as vision and hearing. Additionally, comparison with other CNS-impaired patients, such as unilaterally left- and right-hemisphere damaged, and those with multi-infarct dementia and other dementias would help improve our understanding of the connected language of DAT adults as well as these other syndromes.

Another question to be addressed concerns the syntactic production of DAT adults. Specifically, the relationship between grammatical complexity and the amount of information in the narrative stimulus was evident for the DAT adults. This finding that utterance length was curtailed in the more

content-loaded narrative stimuli, for DAT adults, requires replication and exploration. Perhaps, syntax is not as preserved in DAT as most researchers have suggested. As noted in the prior chapter, it is possible that the reduced syntax in DAT adults may be related to the use of a narrative strategy that is more procedural or list-like rather than subject oriented. Future studies should address production differences among various discourse genres. Additionally, future research should clarify the concept of tangentiality in discourse. An improved operational definition of this term would be a helpful first step. For example, it may prove useful to categorize as tangential all content items that remain after the target content is selected and scored.

Finally, two other directions for future research are offered here. Exploring the relationships of narrative production and semantic and episodic memories might add to our understanding of the nature of the impairment. Also, the pragmatics of narrative production should be further explored. There may be strategies for experimentally disentangling factors such as appreciating the listener's needs in connected language. Functional language measures applied to DAT adults may aim towards global assessement of communicative breakdown as well as revealing specific patterns of deficits.

Clinical Applications

This current investigation stands in a line of other recent studies which consider language behavior extending beyond the sentence level to be clinically relevant for appreciating the nature of DAT as well as formulating appropriate treatment. The clinical implications of this body of research can be far-reaching for the assessment and management of DAT adults. Several applications for diagnostics and intervention are suggested by this current study of the narrative production abilites of adults with DAT.

The procedures used in this study to analyze discourse were found to be effective and reliable. The methods to elicit and quantify narrative production were feasible and yielded measurable results. The task of describing pictures which depicted stories of different amounts of information was relatively quick and easy to administer; moreover, the oral narratives helped to illuminate objective differences among various severities of DAT patients and normal adults in their connected language behavior. The narrative production tasks also showed no floor effect for the demented subjects, all of whom were in the mild-moderate stages; there was also no ceiling effect for the normal controls. Thus, the narrative analysis used here is appropriate for sensitively measuring a fairly wide range of this language behavior.

Current methods to diagnose DAT incorporate an array of

neuropsychological tests and medical exclusionary criteria (McKhann, et al., 1984). Various cognitive and linguistic measures are applied in initial and follow-up assessments to appraise the severity of dementia. Other so-called functional assessments may also be used to judge the impact of the impairments on real life situations. For example, the Global Deterioration Scale (Reisberg, et al., 1982) provides a measure of severity of impairment based on the demented adult's daily functioning. The Communication Abilities in Daily Living (CADL) (Holland, 1980) is a standardized measure of functional language. Recently, Fromm and Holland (1989) examined the functional communication abilities of mild and moderate DAT adults through the CADL and compared their performance to that of normal elderly, elderly depressed, and Wernicke's aphasic subjects. All DAT subjects were well differentiated from the normal elderly and depressed elderly based on that measure of functional communication. One goal of such assessments is to objectify the pattern and rate of behavioral deterioration in DAT adults. Thus, measurement tools need to be both sensitive to clinically relevant deficits and responsive to the progress or change of the behavioral functioning in question.

In this context, discourse measures should be included in the comprehensive evaluation of DAT. These measures of connected language production are not intended as a replacement of traditional mental status or

cognitive testing; rather, they are seen as an addition to and refinement of the current behavioral techniques. This current study documents specific alterations in narrative production of DAT adults in the early and middle stages. Differential diagnosis of early DAT as well as its clinical staging could be advanced by including more objective measures of narrative production such as described in this study. More subjective appraisals of lengthier language production of DAT adults are often made by various health professionals such as speech-language pathologists, psychologists and physicians. Such assessments of connected language are too limited in scope and do not allow accurate documentation of change or making comparisons with other patients.

Early diagnosis of DAT can be aided by narrative production measures. Bayles and Boone (1982) administered a battery of language subtests to differentiate DAT from normal control subjects. They found story retelling, sentence correction, sentence disambiguation, verbal expression (listing the attributes and functions of a common object) and naming to be useful for this purpose. Among these, measures of the amount of information recalled in the story retelling task was similar to the content measures used in this study. More recently, Bayles and her colleagues (1989) used a discriminant function equation to differentiate mild DAT from more moderate severity DAT adults. The most sensitive measures that distinguished these two

groups were the mental status examination, story retelling, the Peabody Picture Vocabulary Test, reading comprehension, sentence disambiguation, and the FAS word fluency subtests.

Another implication of this present work concerns the importance of the discourse task. It was shown that the structure of narrative stimulus can influence various parameters of narrative production for DAT and normal adults. For example, all subjects responded with lengthier narratives when presented with multiple pictures. Both groups also provided more content in the high content narrative condition. The most noteworthy finding of this study was a differential effect of the content condition on the productivity of the experimental subjects. DAT adults performed relatively better in the less densely packed or less detailed narratives.

Taken together with other studies, these task-dependent effects underscore the important role played by narrative stimuli in influencing the features of discourse production. Thus, for characterization of the discourse of DAT adults at various stages to be informative, it should identify the type or types of discourse under evaluation and the stimuli used to elicit them. Failing to report the discourse task used could lead to skewed and limited interpretations. For example, conversational discourse of DAT adults may be abundant and tangential (Overman & Geoffrey, 1987); however, in the more constrained narrative tasks used in this study, the language production of

mild-moderate DAT subjects tended to be less loquacious and show no significant amount of extraneous information. As discourse analysis becomes increasingly refined, the importance of the discourse genre and task will need to be further elucidated.

Another clinical question in the literature concerns the similarities in the language pathology of DAT patients and stroke-related aphasics. The presence of anomic aphasia in early stage DAT adults has been reported by Hier, et al. (1985) and Nicholas, et al. (1985). Of the DAT subjects in this present study, six out of 16 met the criteria for anomic aphasia. All others did not fall below the 93.8 cut-off on the WAB. Although the majority of the DAT subjects showed no frank aphasia as suggested by WAB criteria, they were differentiated from age-matched normal contols on the basis of their narrative production. Thus, the absence of a frank aphasia for a DAT adult does not necessarily predict non-impaired discourse production.

Once a definitive diagnosis of DAT is made, patient management is of the utmost concern. One management technique suggested by this research is to simplify the informational structure of the message when addressing a DAT adult. A message or communication with reduced content might be comprehended with more ease by the demented person. Counseling the family member or caretaker to not overwhelm the DAT adult with too much information may allow more effective communication. Therapeutic

intervention can include family and caretaker education, counseling, the use of compensatory audio and visual aids, and environmental structuring (Overman & Geoffrey, 1987). One aim of the various techniques is to preserve and maximize the functional independence of the DAT adult. The therapeutic use of pictured stories should be explored by treatment professionals. The 16 DAT adults tested in this study were all easily engaged by this task. The use of simple narratives involving familiar situations may stimulate the communication skills of listening and expression. These pictured stories may also be used for improving recognition of pragmatic features such as appreciating the listener's needs, and thus provide a means for improving the effectiveness of the message. These picture story stimuli may be presented to an individual or a group of DAT adults.

While the aim of determining the origins of narrative deficit in DAT adults was not completely fulfilled, it is hoped that this study represents a step forward in this quest. This area of investigation, although still relatively uncharted, appears more approachable. It is hoped that continued work into the nature of narrative production in DAT adults will further open up this field of study.

Table 1. Means for target propositions, information units, words, C-units, clauses/C-unit, C-unit length; indices for fragments, indefinites, anaphora without reference, extraneous statements, and efficiency for DAT subjects by condition.

	Sing.Low	Sing.High	MultiLow	MultiHigh
Propositions	2.6	3.4	2.6	3.5
Info units	7.9	11.1	8.2	11.2
Words	77.3	104.3	92.9	118.8
C-units	9.6	13.4	11.6	15.6
Clauses	1.1	1.1	1.1	1.1
C-unit length	8.2	7.6	8.0	7.1
Fragments	.097	.112	.126	.091
Indefinites	.069	.090	.090	.081
Anaphora	.025	.024	.023	.024
Extraneous	.250	.223	.289	.237
Efficiency	.025	.035	.031	.033

Table 2. Means for target propositions, information units, words, C-units, clauses/C-unit, C-unit length; indices for fragments, indefinites, anaphora without reference, extraneous statements, and efficiency for normal control subjects by condition.

	Sing.Low	Sing.High	MultiLow	MultiHigh
Propositions	5.1	7.4	5.4	7.3
Info units	14.6	20.0	15.0	19.4
Words	107.4	112.8	131.4	143.4
C-units	11.9	12.2	14.3	16.0
Clauses	1.1	1.1	1.1	1.1
C-unit length	8.8	9.3	9.2	9.3
Fragments	.046	.043	.046	.038
Indefinites	.018	.021	.018	.018
Anaphora	.010	.015	.015	.012
Extraneous	.158	.151	.176	.199
Efficiency	.061	.050	.060	.055

Table 3. Correlation matrix for subject variables for DAT subjects.

	Age	Education	MMSE	ICM	WAB
Age		-.26	-.22	.04	.27
Education			.01	.33	.01
MMSE				**-.76	*.56
ICM					*-.58

* P<.05

** p<.01

Table 4. Correlation matrix for target propositions, information units, words, C-units, clauses/C-unit, C-unit length; indices for fragments, indefinites, anaphora without reference, extraneous statements, and efficiency by subject variables for DAT subjects.

	Age	Education	MMSE	ICM	WAB
Propositions	*-.47	.15	*.56	*.58	**.73
Info units	-.39	.20	*.47	*-.53	**.75
Words	-.12	-.08	*.53	*-.47	**.85
C-units	-.08	-.24	*.50	*-.45	**.87
Clauses	-.22	.32	.28	.10	-.07
C-unit length	-.30	.35	.22	-.21	*.52
Fragments	-.05	.38	*-.52	*.50	*-.60
Indefinites	.38	-.38	-.23	.34	-.12
Anaphora	-.13	.12	-.23	*.47	**-.76
Extraneous	.01	.19	*-.47	*.59	-.22
Efficiency	*-.59	.13	*.49	**-.66	.13

* P<.05

** p<.01

Table 5. Correlation matrix for target propositions, information units, words, C-units, clauses/C-unit, C-unit length; indices for fragments, indefinites, anaphora without reference, extraneous statements, and efficiency for DAT subjects.

	In.un.	Word	C-un.	Clau.	C-len.	Frag.	Indef	Anaph	Extr.	Effic.
Prop.	**.97	**.72	**.58	.25	**.64	-.36	*-.51	*-.46	**-.63	**.75
In. unit		**.72	*.56	.14	**.68	-.33	*-.50	*-.54	**-.58	**.68
Words			**.94	.39	**.62	-.35	.03	*-.54	*-.52	.17
C-units				.30	.35	*-.44	.13	*-.46	*-.47	.06
Clauses					*.50	.29	.11	.20	-.08	.06
C-length						.12	-.11	-.31	-.21	.24
Fragm.							.23	*.46	.37	-.26
Indefinites								-.10	*.48	**-.76
Anaph.									.27	-.08
Extr.										*-.57

* P<.05

**p<.01

Table 6. Correlation matrix for target propositions, information units, words, C-units, clauses/C-unit, C-unit length; indices for fragments, indefinites, anaphora without reference, extraneous statements, and efficiency for normal control subjects.

	In.un.	Word	C-un.	Clau.	C-len.	Frag.	Indef	Anaph	Extr.	Effic.
Prop.	**.97	**.76	*.48	**.71	**.65	*-.44	-.17	*-.45	-.28	-.32
In. unit		**.77	**.57	**.64	**.59	*-.49	-.06	*-.42	-.34	*-.42
Words			**.78	**.59	**.69	-.18	.02	-.09	-.14	**-.80
C-units				.02	.09	-.07	.18	.15	-.15	**.76
Clauses					**.92	-.15	-.27	-.41	-.11	-.25
C-length						-.19	-.12	-.32	.02	*-.44
Fragm.							-.04	.38	*.45	-.05
Indefinites								.06	.27	-.39
Anaph.									.08	-.15
Extr.										-.16

* P<.05

**p<.01

APPENDIX A

Target Propositions and Information Units For The Four Narratives Stories

1. MOVING DAY (High Content)

1. A family is moving into a new(empty) house.
2 The front porch has two hanging plants.
3 There are swings and a slide on the lawn.
4 The moving truck is near the house.
5 Two men(movers) are taking furniture from the truck.
6 The boy and girl(children) are chasing the dog.
7 The door of the house is open.
8 They look very excited(happy).
9 The man/father is paying the bill.
10 The "for sale" sign is on the ground.
11 The woman/mother is unloading packages from the car.
12 The weather looks pleasant(sun shining).

1. MOVING DAY (Low Content)

1 A family is moving into a new house.

2 The moving truck is near the house.

3 Two men/movers are taking furniture from the truck.

4 The two children (boy and girl) are chasing the dog.

5 They look very excited(happy).

6 The man/father is paying the bill.

7 The woman/mother is unloading packages from the car.

8 The weather looks pleasant(sun shining).

2. CONCERT IN PARK (High Content)

1 An elderly couple (man and woman) were at a park(field).

2 The sun was setting/rising.

3 A stage was set up on the lawn.

4 The man and woman were attending a concert.

(couple listened to the music)

5 Three musicians(people) played(performed) music.

6 Two people played the flute.

7 One played the piano.

8 They brought a picnic basket (having a picnic).

9 They sat on a blanket near a tree.

10 The man ate a sandwich.

11 The woman poured wine(beverage) into glasses.

12 A vendor was selling ice cream.

2. CONCERT IN PARK (Low Content)

1 An elderly couple were at a park(field).

2 The man and woman were attending a concert.
(couple listened to music).

3 A stage was set up on the lawn.

4 Three musicians(people) played music.

5 Two people played the flute.

6 One played the piano

7 They brought a picnic basket (having a picnic).

8 They sat on a blanket near a tree.

3. BUYING A CAR (High Content)

1 A man and woman were standing in a car showroom(lot).

2 The car lot had 3 cars and 2 motorcycles.

3 They were shopping for a new/used car.

4 They looked at a small sports car which looked like a convertible.

5 The car hood was raised.

6 The price was posted on the car window(dollar signs).

7 The man was examining the price with a concerned look.

8 The roof of the car was down.

9 The woman sat inside the car(test driving).

10 She seemed comfortable(happy) sitting in the driver's seat.

11 A dealer(salesperson) stood(was next to) near the woman.

12 He tried to persuade her to buy it.

3. BUYING A CAR (Low Content)

1 A man and woman were standing in a car showroom(lot).

2 They were shopping for a new/used car.

3 They looked at a small sports car.

4 The price was posted on the car window.

5 The man was examining the price with a concerned look.

6 The woman stood next to the car.

7 A dealer (salesperson) stood near the woman.

8 He tried to persuade her to buy it.

4. MAKING A PIE (High Content)

1 A grandmother(mother) was demonstrating how to make a pie (prepare meal/bake).

2 It looks like some kind of holiday time.

3 She and her 4 small grandchildren were in a kitchen.

4 The clock over the refrigerator said 4 o'clock.

5 One boy was standing at the counter(table).

6 He was cutting up some apples(fruit).

7 A smaller boy stood near him and ate some of the apples.

8 The girl was standing in front of her grandmother.

9 The girl was trying to roll out the dough(flour).

10 There's a large turkey(chicken) at the table.

11 The grandmother told another girl to turn on the oven(stay away from).

12 Everyone looked happy

4. MAKING A PIE (Low Content)

1 A grandmother was demonstrating how to make a pie(prepare meal/bake).

2 It looks like some kind of happy holiday time.

3 She and her 4 small grandchildren were in a kitchen.

4 One boy was standing at the counter(table).

5 He was cutting up some apples(fruit).

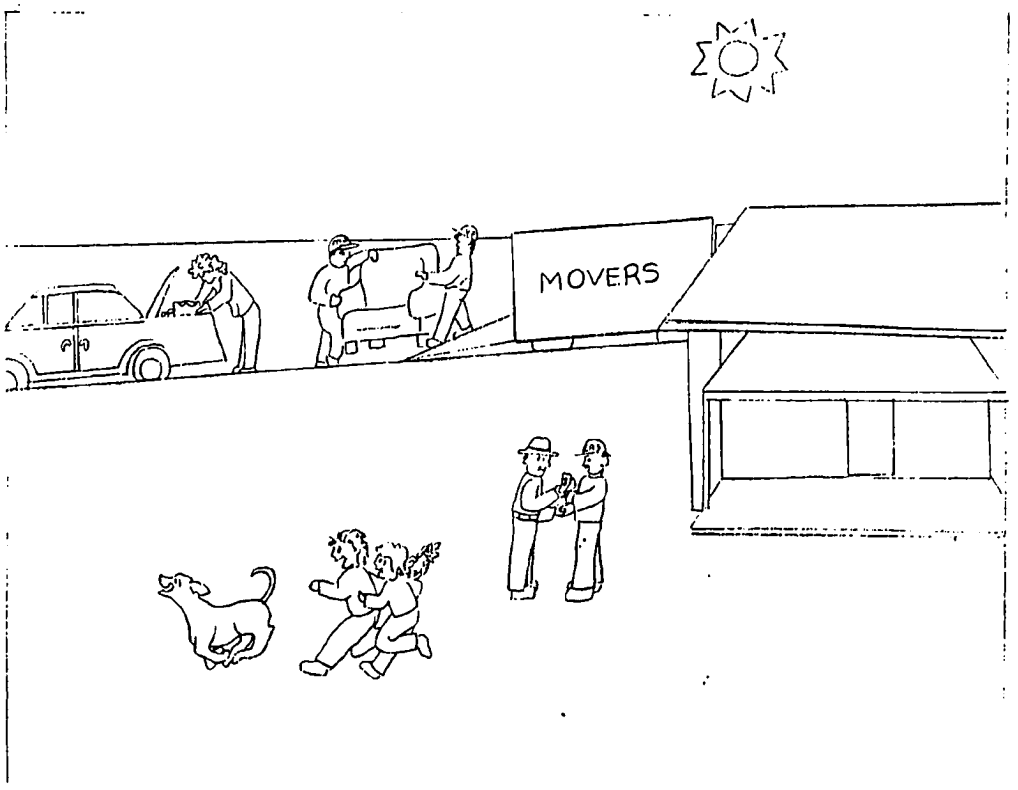
6 The girl was standing in front of her grandmother.

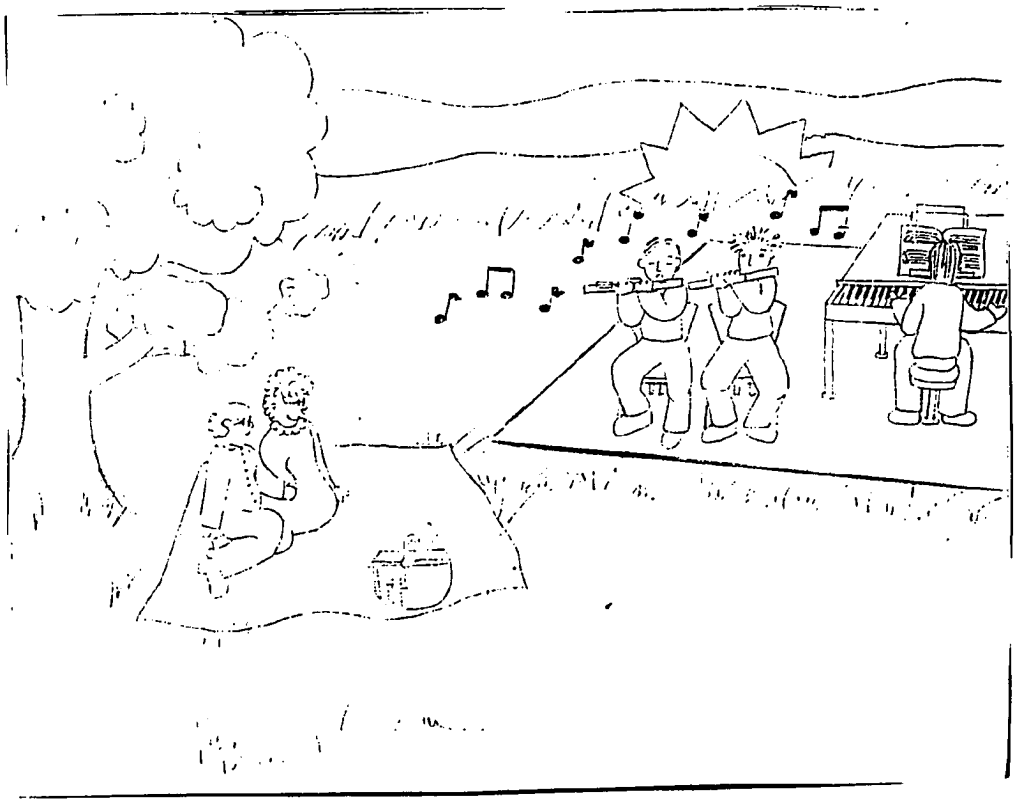
7 The girl was trying to roll out the dough(flour).

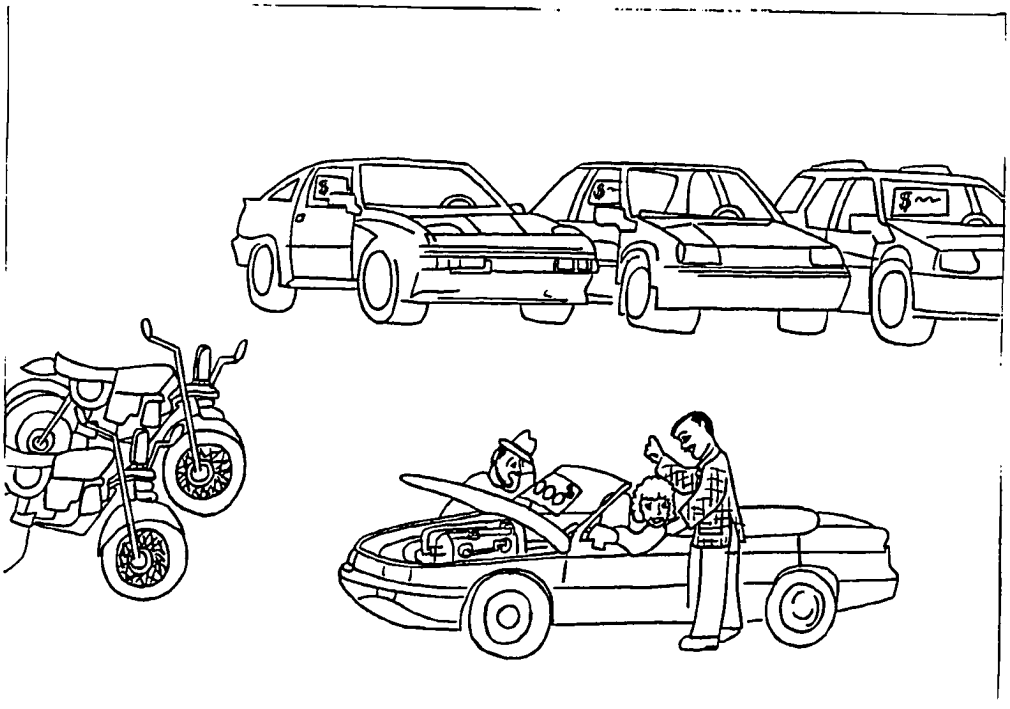
8 The grandmother told another girl to turn on the oven(stay away from).

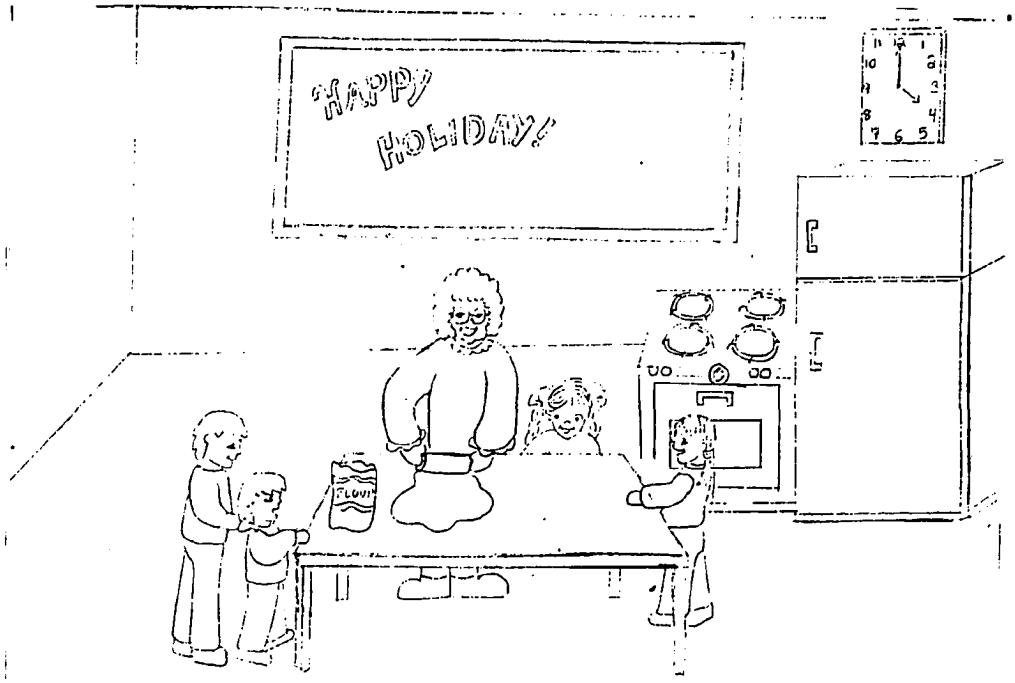
APPENDIX B

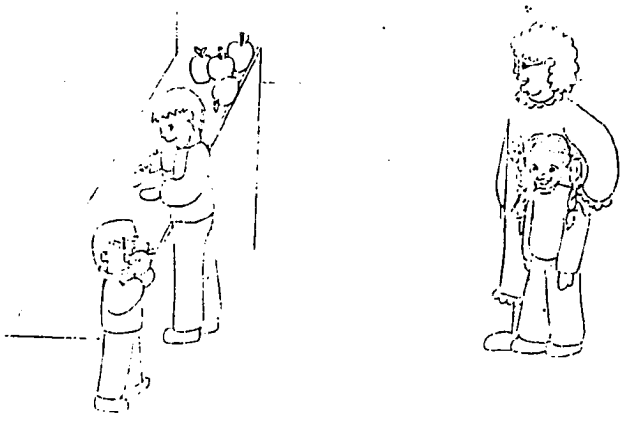
Samples of picture stimuli: SL of "Moving", SL of "Concert", SH of "Buying a Car", and MH of "Making a Pie"

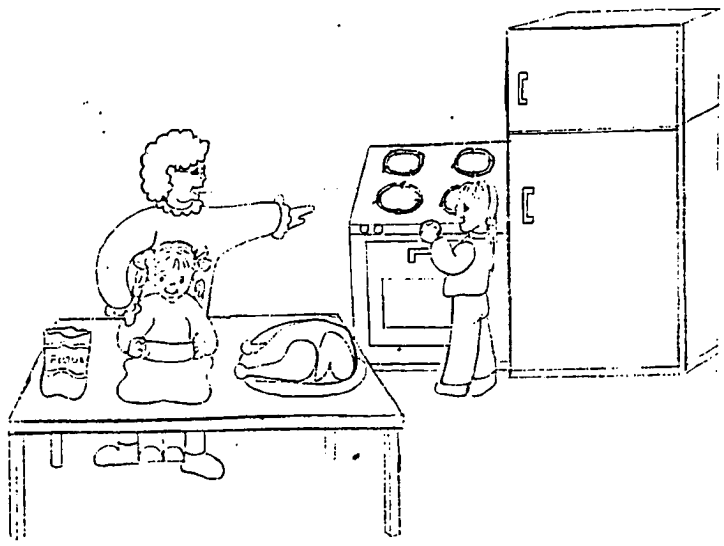












APPENDIX C

Presentation order of narrative stimuli for conditions single picture-low content (SL), single picture-high content (SH), multiple picture-low content (ML), and multiple picture-high content (MH) with the stories "Moving" (A), "Concert" (B), "Buying Car" (C), and "Making Pie" (D).

Subject	Order of Presentation			
	1	2	3	4
1	A-SL	B-SH	C-ML	D-MH
2	A-SH	B-MH	C-SL	D-ML
3	A-ML	B-SL	C-MH	D-SH
4	A-MH	B-ML	C-SH	D-SL
5	B-SL	D-SH	A-ML	C-MH
6	B-SH	D-MH	A-SL	C-ML
7	B-ML	D-SL	A-MH	C-SH
8	B-MH	D-ML	A-SH	C-SL
9	C-SL	A-SH	D-ML	B-MH
10	C-SH	A-MH	D-SL	B-ML

11	C-ML	A-SL	D-MH	B-SH
12	C-MH	A-ML	D-SH	B-SL
13	D-SL	C-SH	B-ML	A-MH
14	D-SH	C-MH	B-SL	A-ML
15	D-ML	C-SL	B-MH	A-SH
16	D-MH	C-ML	B-SH	A-SL

APPENDIX D

Inter-rater reliability based on a quasi-random selected 10% of narratives, using (# of agreements/# of agreement + disagreements) X 100.

Propositions	87%
Information Units	87%
C-units	96%
Clauses	81%
Fragments	82%
Indefinites	82%
Anaphora without Reference	90%
Extraneous	85%

APPENDIX E

Sample Transcriptions of Oral Narratives of DAT Subjects

1. R.B., 70 year old female, MMS of 14, WAB of 76.3; Single-Low condition of "Moving":

It appears that [uh] they're either moving or just going someplace//
But in any case the movers are [are] working on here//
(Excuse me something's come up here)
[Uh they're] You can see/ that they're paying or giving money having to do with the [uh] whatever/ it is that's happening//

2. A.L., 69 year old female, MMS of 16, WAB of 90.5; Multiple-Low condition of "Concert":

This is children [this is children]//
They are taking the (I guess) [the] whatever/ they have to do//
This is probably their mother playing the piano for them//
(It would have to be colored to look like something)

And this here too is the thing/ that was music with the two little boys//

(I don't know but) they've got a nice tree here (you have to maybe color and make nice)//

They seem to be sitting down here some//

(But they have to be colored ya'know usually you color)

They're playing music with their mouth with a guitar (I guess) [not a guitar that's a guitar] (what do you call it if you play a music isn't it)//

3. L.A., 73 year old male, MMS of 25, WAB of 97.2; Multiple-Low condition of "Making Pie":

This looks like the kitchen//

And then [the the] the lady looks like/ she gonna cook or fixing to cook//

Or she serve dinner or supper or something//

I see the refrigerator in there//

And then it's the [birthday] holiday (I don't know) what holiday it is//

But it's a holiday//

Then this little kid there he's on the shelf there//

He's got some apples or oranges or something on the table//

Looks like he's peeling the bananas or something//

Then (in the other picture) you have.. the mother//

She look like she got the rolling pin//

And they're rolling the flour to make some biscuits or something there//

And I see the stove ice refrigerator//

(That's all I see) See apples too (O.K.)//

4. C.D., 83 year old male, MMS of 23, WAB of 93.8; Multiple-High condition of "Moving":

Well one looks like [a house] in back of a house by a truck a playground//

And there's [four children or] two children and two adults there//

And [uh] this looks like it's going by this playground//

It looks like [like] an outerhouse//

And the [the] (next picture) has a ..place/ where they're fixing furniture//

And they're movers//

In other words they're loading furniture and movers//

And there's a dog with two children running after them//

And this is a plain garage//

And there's a car with the hood up//

Something probably wrong with it//

Two guys out here arguing or something (that's about it)//

There's a star up there//

There's two kids chasing a dog//

5. P.K., 78 year old female, MMS of 16, WAB of 92.6; Single-Low condition of "Making a Pie":

There's a sign "Happy Holiday" on the top//

[There's another] there's a child by the gas stove//

There's another child cutting the fruit or an apple/ whatever it is there//

There's a table/ where the little child sitting on the table//

There's a flour jar [and another's..] and a big table//

And the mother's pointing to the little child to do something in the gas stove//

And you got a rolling pin//

Well [the apples he's cutting] he's peeling an apple//

And she's lighting the stove//

The mother's pointing//

The child has got the rolling pin//

And there's a bowl of flour//

And there's the table and the chairs and [oh] an icebox//

6. C.R., 75 year old male, MMS of 19, WAB of 94.8; Multiple-High condition of "Buy a car":

Evidently arrive in advance//

There's two people standing by an automobile with top down//

There's three other vehicles automobiles and two other motorcycles//

It seems as though/ they're going on a drive [a ride] somewhere//

The three [the three] cars mentioned are evidently up for sale//

And they have the marks of money in the window but no price//

There's one man/ who is looking at the motor//

It's the top of the motor being lifted//

And the third car there will be two people come in//

One man and the young lady will evidently [will] not have arrived//

The third car there're [two men I mean] one man and one lady//

And both of them have been either in or around with two previous people//

There's [motorcy] two motorcycles standing but no occupants in here//

7. E.B., 68 year old, MMS of 19, WAB of 97; Single-Low condition of "Moving":

Well (I guess) they're moving (I guess)//
There's the dog and the two children (I don't know who these are)//
(I guess) [They're moving the fur.] (I guess) They're moving (that's abount all I can say)//
That must be the mother//
And they're taking the furniture out//
(And that's about all) The dog and the two kids//
(I don't know who these two are) That must be the mother//
(And that's that's about all I can say. I guess that's about it)
And the house is empty//
(I don't know what) these two are doing//
They're chasing the dog//
And the mother was drinking (I don't know) [something out of the]//
Movers moving taking the furniture out (Why'd you pick me?)//

APPENDIX F

Sample Transcriptions of Oral Narratives of Normal Subjects

1. C.S., 74 year old female; Single-High condition of "Moving":

Well the sun is out//
And the lady's [having] taking a package out of a car//
And (I see) two men moving some furniture//
And (I see) a sliding pond and two swings//
One is lower than the other//
And..two children running after the dog//
And two men (I can't make that out)//
And there's a house for sale//
Sign laying down on the ground//
Looks like the door is open//
And there's two plants hanging up there//

2. M.V., 68 year old female; Multiplel-High condition of "Concert":

Well it looks like two older people reminiscing over some kind of song or something/ that happened years ago//

Sitting in a field//

And...seems to be a [sun] sunset or something (I don't know)

sunrise or sunset//

And they seem to be happy//

(In the second picture) They're on some kind of platform performing//

Looks like they're young three men or boys//

They're playing some kind of . music//

It could be some kind of theater//

But it looks like grass around the outside//

Might be out in the fields also//

(In the third one) Looks like somebody's having a picnic//

And it reminds me of the same people//

And they're having a picnic having wine or some kind of drink//

Well a man's trying to sell ice cream (it looks like)//

But they're not paying any attention to him//

(I don't know. That's all I see) They're sitting in the grass in the picnic//

(That's what I see)

3. B.B., 78 year old male; Single-High condition of "Making Pie":

Well it's evidently in the kitchen//
Happy Holiday sign there//
Clock on the wall shows four O'clock//
And there's two children eating fruit on the left side//
The mother's in the [pr] preparatory stage of [uh] probably baking or roasting a turkey or a large chicken or a capon//
the little girl on the top of the table is obviously gonna try to help her out//
And the other girl near the range is manipulating with a dial//
The ice box of course (I can't tell you anything about it) [it's empt] It's closed/ so there's nothing to show anything//
(No I don't think I missed anything) Even the clock isn't going//

REFERENCES

Appell, J., Kertesz, A. & Fisman, M. (1982). A study of language functioning in Alzheimer patients. Brain and Language, 17, 73-91.

Bayles, K. A. (1982). Language function in senile dementia. Brain and Language, 16, 265-280.

Bayles, K. A. (1986). Management of neurogenic communication disorders associated with dementia. In R. Chapey (Ed.), Language Intervention Strategies In Adult Aphasia. Williams and Wilkins, Baltimore, MD.

Bayles, K. A. & Boone, D. R. (1982). The potential of language tasks for identifying senile dementia. Journal of Speech and Hearing Disorders, 47, 210-217.

Bayles, K. A. & Kaszniak, A. W. (1987). Communication and Cognition in Normal Aging and Dementia. College Hill Press. Boston, MA.

Bayles, K. A., Boone, D. R., Tomoeda, C. K., Slauson, T. J., & Kaszniak, A. W. (1989). Differentiating Alzheimer's patients from the normal elderly and stroke patients with aphasia. Journal of Speech and Hearing Disorders, 54, 74-87.

Beaugrande, R. de (1980). Text, Discourse, and Process. Toward a multidisciplinary science of texts. Vol. IV. In R. O. Freedle (Ed.) Advances in Discourse Processes. Ablex Publishing Corp., NJ.

Beeson, P. M., Bayles, K. A., Tomoeda, C. K., & Slauson, T. J. (1987). Oral discourse in demented, aphasic, and elderly individuals: Content analysis. Paper presented at the annual meeting of the American Speech-Language Hearing Association, New Orleans, LA.

Blessed, G., Tomlinson, B. E., and Roth, M. (1968). The association between quantitative measures of dementia and of senile change in the cerebral grey matter of elderly subjects. British Journal of Psychiatry, 114, 797-811.

Cummings, J. L. & Benson, D. F. (1983). Dementia, A Clinical Approach. Woburn, MA: Butterworth.

Cummings, J. L., Benson, D. F., Hill, M., & Read, S. (1985). Aphasia in dementia of the Alzheimer's type. Neurology, 35, 394-397.

Davis, G. A. & Wilcox, M. J. (1985). Adult Aphasia Rehabilitation, College Hill Press, San Diego, CA.

Ehrlich, J. S. (1988). Selective characteristics of narrative discourse in Head-injured and normal adults. Journal of Communication Disorders, 21, 1-9.

Engel-Ortlieb, D. (1981). Discourse processing in aphasia. Text 1, 4, 361-383.

Ernest-Baron, C. R., Brookshire, R. H., & Nicholas, L. E. (1987). Story structure and retelling of narratives by aphasic and non-brain-damaged adults. Journal of Speech and Hearing Research, 30, 44-49.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). Mini-mental state, A practical method for grading the cognitive state of patients for the clinician.

Journal of Psychiatric Research, 12, 189-198.

Freedman-Stern, R., Ulatowska, H. K., Baker, T., & DeLacoste, C. (1984). Disruption of written language in aphasia: a case study. Brain and Language, 22, 181-205.

Fromm, D. & Holland, A. L. (1989). Functional Communication in Alzheimer's Disease. Journal of Speech and Hearing Disorders, 54, 535-540.

Fuld, P. A. (1978). Psychological testing in the differential diagnosis of the dementias. In R. Katzman, R. Terry, and K. Bick (Eds.) Alzheimer's disease: senile dementia and related disorders. (Vol. 7). New York, Raven Press.

Garrett, M. F. (1980). Levels of processing in sentence production. In B. Butterworth (Ed.), Language Production, (Vol. 1). New York, Academic Press.

Gleason, J. B., Goodglass, H., Obler, L., Green, E., Hyde, M. R., & Weintraub, S. (1980). Narrative strategies of aphasic and normal speaking subjects. Journal of Speech and Hearing Research, 23, 370-382.

Halliday, M. A. K. and Hasan, R. (1976). Cohesion In English. London: Longman.

Halpern, H., Darley, F. L., & Brown, J. R. (1973). Differential language and neurologic characteristics in cerebral involvement. Journal of Speech and Hearing Research, 38(2), 162-173.

Hier, D. B., Hagenlocker, K., & Shindler, A. G. (1985). Language disintegration in dementia: Effects of etiology and severity. Brain and Language, 25, 117-133.

Holland, A. L. (1980). Communication Abilities in Daily Living. Austin: Pro-Ed.

Horner, J., Heyman, A., Kanter, J., Royall, J. B., & Aker, C. R. (1983). Longitudinal changes in spoken discourse in Alzheimer's dementia. Paper presented at the annual meeting of the International Neuropsychological Society, Mexico City.

Huber, W. & Gleber, J. (1982). Linguistic and nonlinguistic processing of narratives in aphasia. Brain and Language, 16, 1-18.

Irigaray, L. (1973). Le Langage Des Dements, The Hague: Mouton.

Joanette, Y., Goulet P., Ska, B., and Nespoulous, J. (1986). Informative content of narrative discourse in right-brain-damaged right-handers. Brain and Language, 29, 81-105.

Kempler, D., Curtiss, S., & Jackson, C. (1987). Syntactic preservation in Alzheimer's disease. Journal of Speech and Hearing Research, 30, 343-350.

Kertesz, A. (1982). The Western Aphasia Battery. Grune & Stratton, N.Y.

Kintsch, W. (1974). The Representation of Meaning in Memory. Lawrence Erlbaum, Hillsdale, NJ.

Loban, W. (1976). Language development: Kindergarten through grade 12. (Research Report no. 18). National Council of Teachers of English, Urbana, IL.

Martin, A. & Fedio, P. (1983). Word production and comprehension in

Alzheimer's disease: The breakdown of semantic knowledge. Brain and Language, 19,1, 124-141.

Murdoch, B. E., Chenery, H. J., Wilks, V., & Boyle, R. S. (1987). Language disorders in dementia of the Alzheimer type. Brain and Language, 31, 122-137.

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

Obler, L. K. (1980). Narrative discourse style in the elderly. In L. K. Obler and M. L. Albert (Eds.), Language and Communication in the elderly. Lexington, MA: Heath.

Obler, L. K. (1981). Review: Le Langage des dements, By Luce Irigary. The Hague: Mouton, 1973. Brain and Language, 12, 375-386.

Obler, L. K. (1983). Language and brain dysfunction in dementia. In S. Segalowitz (Ed.), Language Functions and Brain Organization. Acad. Press, N.Y.

Overman, C. A. & Geoffrey, V. C. (1987). Alzheimer's Disease and Other Dementias. In H. G. Mueller and V. C. Geoffrey (Eds.), Communication Disorders in Aging, Assessment and Management. Gallaudet Univ. Press, Wash. D. C.

Reisberg, B., Ferris, S. H., De Leon, M. J. & Crook, T. (1982). The Global Deterioration Scale (GDS): An instrument for assessment of primary degenerative dementia (PDD). American Journal of Psychiatry, 139, 1136-1139.

Ripich, D. N. & Terrell, B. Y. (1988). Patterns of discourse cohesion and coherence in Alzheimer's disease. Journal of Speech and Hearing Disorders, 53, 8-15.

Santo Pietro, M. J., & Berman, R. (1984). Analysis of connected speech in institutionalized elderly with and without senile dementia. Paper presented at the annual meeting of the American Speech-Language Hearing Association, San Francisco, CA.

Schwartz, M., Marin, O., & Saffran, E. (1979) Dissociations of language function in dementia: A case study. Brain and Language, 7, 277-306.

Shekim, L. O. & LaPointe, L. L. (1984). Production of discourse in individuals with Alzheimer's disease. Paper presented at the 12th annual meeting of the International Neuropsychological Society, Houston, TX.

Smith, S. R., Chenery, H. J., & Murdoch, B. E. (1989). Semantic abilities in dementia of the Alzheimer's type. 2 Grammatic Semantics. Brain and Language, 36, 533-542.

Stachowiak, F. J., Huber, W., Poeck, K., & Kerschensteiner, M. (1977). Text comprehension in aphasia. Brain and Language, 4, 177-195.

Ulatowska, H. K., North, A. J., & Macaluso-Haynes, S. (1981). Production of narrative and procedural discourse in aphasia. Brain and Language, 18, 315-341.

Ulatowska, H. K., Freedman-Stern, R., Weiss-Doyel, A., Macaluso-Haynes, S., & North, A. J. (1983). Production of narrative discourse in aphasia. Brain and

Language, 19, 317-341.

Ulatowska, H. K., Allard, L., Donnell, A., Bristow, J., Haynes, S., Flower, A. & North, A. J. (1988). Discourse performance in subjects with dementia of the Alzheimer's type. In H. A. Whitaker (Ed.) Neuropsychological studies of non-focal brain damage. Springer-Verlag, N. Y.

Ulatowska, H. K. & Bond Chapman, S. (1990). Discourse changes in dementia. In R. Lubinski (Ed.) Dementia in Communication: Research and Clinical Implications, B. C. Decker, Phila, PA.

Whitaker, H. A. (1976). A case of isolation of the language function. In H. Whitaker and H. A. Whitaker (Eds.), Studies in neurolinguistics: Vol. 2. NY, Academic Press.

Wyckoff, L. H. (1984). Narrative and procedural discourse following closed head injury. Doctoral Dissertation, Univ. of Florida.

Yorkston, E. & Beukelman, D. (1980). An analysis of connected speech samples of aphasic and normal speakers. Journal of Speech and Hearing Disorders, 45, 27-36.