IDEATIONAL AND SEMANTIC CONTRIBUTIONS TO NARRATIVE PRODUCTION IN ADULTS WITH DEMENTIA OF THE ALZHEIMER'S TYPE

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The narrative production of adults with probable dementia of Alzheimer's type (DAT) was investigated to determine the extent to which cognitive or linguistic deficits might explain the breakdown of discourse production. The structure of narrative tasks was manipulated so 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. The DAT subjects exhibited reduced content in terms of propositions and lexical items, shorter sentence lengths with more sentence fragments and reference errors. The mode of picture display failed to influence the amount of target content, or the grammatical performance of subjects. However, when compared to the normal controls, the amount of information pictorially represented significantly influenced the content provided by the DAT subjects; 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. © 1997 by Elsevier Science Inc.

Educational Objectives: Readers will develop knowledge of the relationships between cognitive or linguistic deficits and the breakdown of discourse production in persons who have dementia of the Alzheimer's type.

INTRODUCTION

The language production deficits in adults with dementia of Alzheimer's type (DAT) show several consistent features and patterns. This clinical picture in-
cludes semantic paraphasias (Bayles, 1982), a reduced vocabulary (Hier, Hagenlocker, & Shindler, 1985), a marked deficit on confrontation naming (Martin & Fedio, 1983), and repetitiveness, tangentiality, and the use of indefinite terms in discourse (Horner, Heyman, Kanter, Royall, & Aker, 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, Obler, Albert & Helm-Estabrooks, 1985) in the early stages of DAT and Wernicke’s and transcortical sensory aphasia in more advanced stages (Appell, Kertesz, & Fisman, 1982; Murdoch, Chenery, Wilks & Boyle, 1987). These findings help support the case for inclusion of language deficits into the diagnostic criteria of dementia (Bayles, 1982; Cummings & Benson, 1985).

Discourse abilities in DAT adults deteriorate in a characteristic way (Irigaray, 1973; Obler, 1981; Horner, et al., 1983; Bayles, 1986). 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, then little or no speech in the late stages. Several stages of discourse changes (Horner, et al., 1983; Obler, 1983) have been identified. In early stages of DAT, more elaborate speech with occasional repetition of ideas emerges. In the middle stages of the disease, this may develop into more frequent repetition and revision of ideas, paragrammatisms, and a decrease in the amount of information relative to the amount of talk. Characteristic of the language in late stages of DAT are: cluttering of repetitions, revisions, intrusions, a decreased mean length of utterance, and excessive speech or failure to initiate talk.

Recent studies that focus on the narrative production abilities of DAT adults reveal several consistent features. Across a range of tasks such as describing a picture, procedural tasks (i.e. telling how to do something) and talking about a topic, the DAT adults show limitations in the expression of content (Santo Pietro & Berman, 1984; Hier, et al., 1985; Ulatowska, et al., 1988) and the use of cohesion (Shekim & La Pointe, 1984). In particular, story content that requires the drawing of inferences may be more vulnerable to loss in these patients (Beeson, Bayles, Tomoeda & Slauison, 1987). Their discourse may contain more sentence structure deviations or fragments (Shekim & La Pointe, 1984; Hier, et al., 1985; Smith, Chenery, & Murdoch, 1989) and fewer unique words (Hier, et al., 1985) when compared with the discourse of the normal elderly. Their discourse may also include more exophora, i.e. references to information outside of the text (Shekim & La Pointe, 1984), as well as an increase in words that have inadequate references (Hier, et al., 1985; Ulatowska, et al., 1988). Curiously, despite these findings detailing decrements in narrative production abilities of DAT adults, listener judgments of conversational discourse coherence failed to discriminate DAT from normal subjects (Ripich & Terrell, 1988; Ulatowska, et al., 1988).
Ample evidence is available to hypothesize 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 incorporates the executive functions of goal formation and planning. That is to say, 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 similar to Garrett’s (1980) “message level” representation, operates autonomously from linguistic mapping.

The main purpose of this study was 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.

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. Given this prediction, the language declines should not be sensitive to the narrative task employed in this study that manipulates the amount of content.

Alternatively, an ideational impairment should be sensitive to the narrative task structure or the message to be communicated. In 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. This would demonstrate that narrative production of the DAT adult represents more than a semantic-lexical impairment, and is influenced by the informational structure of the message to be communicated. Operationally, the research question posed here asks whether the amount of information or propositional content pictorially represented influences the relative amount of content provided by DAT adults.

METHODS

Subjects

Thirty-two experimental and control subjects participated in this study. Sixteen DAT subjects were selected according to the NINCDS-ADRDA Work Group’s (McKhann, Drachman, Folstein, Katzman, Price, & Stadlan, 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, Folstein & McHugh, 1975) and an adaptation (Fuld, 1978) of the Information-Concentration-Memory test (ICM) of Blessed, Tomlinson, & Roth (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 clinically 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 screening criteria. The majority of these instances 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; SD = 7.4). The mean numbers of years of education for the DAT subjects was 11.5 (SD = 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 (SD = 4.6). The Information-Concentration-Memory test (ICM) administered to 13 of the 16 DAT subjects, yielded a mean error score of 14.8 (SD = 4.5) out of a possible 33 errors. Experimental subjects were in the mild to moderate stages of DAT. 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 (SD = 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 which consisted of adult subjects matched by age, sex, and education level to the experimental group exhibited no history of neurological or psychiatric disorders. The control group consisted of 8 males and 8 females with ages ranging from 65 to 83 (Mean = 73.2; SD = 5.3). Years of education for the control subjects was 11.8 (SD = 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 (SD = 1.0). As would have been expected,
groups were found to differ significantly on this cognitive measure ($F = 19.51, p < .0001$).

**Procedure**

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 was 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, such as "Is there anything else that you see going on in the picture(s)?" At 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 narrative responses were audiotaped on a cassette tape recorder. Finally, the language subtests of the WAB and the cognitive screening measures were administered to the DAT subjects at the time of this testing.

**Design**

The complexity of narrative was manipulated along two dimensions 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 consid-
ered a clause, was defined as two concepts with a relation between them (Beaugrande, 1984). The 8-proposition texts contained approximately 28 information units, and the 12-proposition texts contained approximately 42 information units. An information unit corresponded to a substantive part of speech (e.g., noun, verb, adjective) which contributed 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 equally distributed among the three pictures. For example, each sequence picture of the 12 proposition narrative represented four propositions. This 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 titled: Moving Day (1), Concert in Park (2), Buying a Car (3), and Making a Pie (4). All of these line drawings were produced 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. Examples of one of the corresponding written narratives on which the artist based the drawings and one of the picture stimuli are located in Appendix A and Figure 1. Four separate narratives were elicited

![Figure 1. Example of stimulus picture to moving day (low content).](image-url)
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.

All narrative samples were transcribed into standard English orthography 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 criteria used in the text segmentation were adapted in our pilot analyses from Wyckoff (1984) (Appendix B).

Scoring

1. 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.). Substitution of an equivalent term received full credit towards the proposition because it was found during pilot testing that normal adults exhibit much variation in the specific lexical items used on these tasks (e.g. “the kids chased a dog,” “the boy and girl played with a dog”). Pronouns were acceptable only when their referents were specified in any of the prior utterances.

2. Information units were tallied based on a list of lexical target forms or their equivalents. Some adjustments were made in the criteria for scoring information units as 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 counted as two words. Fragments and extraneous statements were excluded from 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”) were tallied as potential instances
of incomplete reference, and when added to such terms as "thing" and "something," labeled as *indefinites*.

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

8. Self-referential and extraneous statements were tallied separately, and divided by the word total in order to measure 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.

**RESULTS**

The independent variables included 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 for each condition. The main dependent variable was the amount of content in terms of target propositions as well as measures of information units, indefinites, anaphora without reference, proportion of sentence fragments, extraneous statements and efficiency, and grammatical complexity (C-unit analysis). Correlation matrices were generated for these narrative parameters and the linguistic (i.e., WAB) and cognitive measures (i.e., ICM, MMS).

**Target Propositions and Information Units**

The DAT and normal subjects differed on the number of target propositions ($F = 31.068, p < .001$) where the DAT group provided a mean of 3.03 (SD =

<table>
<thead>
<tr>
<th></th>
<th>Single Low</th>
<th>Single High</th>
<th>Multi-Low</th>
<th>Multi-High</th>
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</thead>
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<td>2.6</td>
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<td>2.6</td>
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<td>1.1</td>
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<td>8.0</td>
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<td>0.126</td>
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<tr>
<td>Indefinites</td>
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<td>0.090</td>
<td>0.090</td>
<td>0.081</td>
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<tr>
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<td>0.023</td>
<td>0.024</td>
</tr>
<tr>
<td>Extraneous</td>
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<td>0.223</td>
<td>0.289</td>
<td>0.237</td>
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<tr>
<td>Efficiency</td>
<td>0.025</td>
<td>0.035</td>
<td>0.031</td>
<td>0.033</td>
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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

<table>
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<th>Multi-High</th>
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</thead>
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<tr>
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<td>5.4</td>
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<tr>
<td>C-units</td>
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<tr>
<td>Clauses</td>
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<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>C-length</td>
<td>8.8</td>
<td>9.3</td>
<td>9.2</td>
<td>9.3</td>
</tr>
<tr>
<td>Fragments</td>
<td>0.046</td>
<td>0.043</td>
<td>0.046</td>
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<tr>
<td>Indefinites</td>
<td>0.018</td>
<td>0.021</td>
<td>0.018</td>
<td>0.018</td>
</tr>
<tr>
<td>Anaphora</td>
<td>0.010</td>
<td>0.015</td>
<td>0.015</td>
<td>0.012</td>
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<tr>
<td>Extraneous</td>
<td>0.158</td>
<td>0.151</td>
<td>0.176</td>
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<tr>
<td>Efficiency</td>
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<td>0.050</td>
<td>0.060</td>
<td>0.055</td>
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</table>

1.97) target propositions per narrative across all conditions, the normal controls averaged 6.3 (SD = 1.29). 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 to say, the representation of narrative stimuli as single picture or multiple picture formats 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.

1The 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. Because 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. 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 evidenced 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 due to differences between the two studies. 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.
A significant Group by Content interaction \((F = 5.767, p < .02)\) was found which was examined further through post-hoc testing. The Scheffé test indicated significant differences \((p < .05)\) between the low and high content conditions for the normals where they provided more content in the high condition than in the less dense counterpart. By contrast, for the DAT group, the difference between high and low content conditions was not significant. Thus, compared to the normals, the DAT subjects provided relatively less content in the high as compared to the low content condition.

There were large group \((F = 33.864, p < .001)\) and content effects \((F = 46.413, p < .001)\) for the number of information units, or target substantive words in the narrative production. The DAT subjects had a mean of 9.6 (SD = 4.38) and the normals had a mean of 17.25 (SD = 2.90) information units across all conditions. There were no significant interactions for any of the conditions. Table 3 shows the means for all the narrative variables for DAT and normal controls when all conditions were averaged.

**Words, C-Units, C-Unit Length, Fragments and Clauses**

There was a significant main effect for content \((F = 7.802, p < .009)\) for the total number of words per narrative. 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. Due to great inter-subject variability, 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 (SD = 44.1) and for the controls was 123 (SD = 39.7).

**Table 3.** 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 and Normal Control Subjects Averaged Across Conditions

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<tr>
<td>Info units</td>
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<tr>
<td>Words</td>
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<td>C-units</td>
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<td>Clauses</td>
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<tr>
<td>C-length</td>
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<tr>
<td>Fragments</td>
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</tr>
<tr>
<td>Indefinites</td>
<td>0.08</td>
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<tr>
<td>Anaphora</td>
<td>0.02</td>
<td>0.01</td>
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<td>0.17</td>
</tr>
<tr>
<td>Efficiency</td>
<td>0.03</td>
<td>0.06</td>
</tr>
</tbody>
</table>
There was a significant main effect for 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. There was, however, a significant Group by Content interaction \( (p < .034) \). As confirmed by the Scheffé's test \( (p < .05) \), the normal control's narrative length in terms of C-units could not be differentiated by the content condition. However, the DAT subjects produced relatively fewer C-units in the low compared to the high content condition.

The average number of words per C-unit differed significantly by group with the DAT subjects providing shorter sentences than the normal controls \( (F = 4.831, p = .036) \). The average C-unit lengths for DAT and normal control subjects were 7.73 and 9.15 respectively. No main effect resulted for the content condition. However, the interaction of group with content was significant \( (p < .01) \). Post-hoc testing using the Duncan test \( (p < .05) \) showed that DAT subject's 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 8.1 and 7.4 in the low and high conditions respectively.

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 .11 (SD = .104) and for the normal controls was .04 (SD = .016). The DAT group had more instances of sentence fragments in their narratives regardless of the content condition.

A significant main effect \( (F = 53.342, p < .001) \) for group was noted for the index of indefinites (i.e., number of instances of deictic terms divided by word total). There was no main effect for the content condition. The DAT and control groups had mean indexes of indefinites of .08 (SD = .034) and .02 (SD = .009), respectively.

There were no significant effects for the number of clauses per C-unit for group and content. The mean number of clauses per C-unit for the DAT and control subjects was 1.09 (SD = .074) and 1.12 (SD = .116), respectively.

### Anaphora, Extraneous Statements, and Efficiency

A group effect for anaphora, computed as an index or ratio of instances of anaphora without reference by the word total, fell just short of the .05 level of significance \( (F = 3.798, p = .061) \). The DAT and control groups had mean anaphora indexes of .025 (SD = .019) and .013 (SD = .013), respectively.

There were no significant group \( (F = 1.313, p = .261) \) or content \( (F = .212, p < .5) \) effects for the number of extraneous statements per narrative. The DAT and control group had mean indexes of extraneous statements of .25 (SD = .25) and .17 (SD = .12), respectively. Similar to the values for total
words, there was much intersubject variability within groups for this measure of tangentiality.

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 .03 (SD = .013). The normal controls scored a significantly higher mean of .06 (SD = .016). There was no content effect for this variable.

**Correlations**

Correlation matrices were generated for DAT and normal subjects for the key variables. 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 the narrative variables of target propositions, information units, words, C-units, C-unit length, fragments, and anaphora without reference and not clauses, indefinites, and extraneous statements. 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. This arose 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.

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 with the exception of clauses and fragments for the DAT subjects. However, for the normal controls, the number of information units was associated with all but indefinites and extraneous statements. For DAT subjects, the word total correlated well with all narrative variables with the exception of clauses, fragments, indefinites, and efficiency. 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 for the DAT group, and with extraneous statements for the normal group.

**Reliability**

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. Interrater reliability quotients were greater than 80% for all of the variables with the exception of anaphora without reference, which was 70%.

DISCUSSION

With respect to the basic question of this paper, we report that compared to normal controls, the DAT subjects conveyed relatively more content in the low content condition or less dense narrative. 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 narrative production of DAT adults, and thus is in accord with the ideational explanation of narrative dysfunction. The DAT subject's particularly diminished narrative content in the high content condition points to impairment that extends beyond semantic-lexical processing and reflects, at least in part, an ideational impairment.

Apart from C-units and C-unit length, there were no other interactions between group and conditions on the other variables. 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. Because these narrative variables were either diminished across the board for DAT subjects, or else unaffected by the narrative 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 weight on these variables in conjunction with the overall lower scores of the DAT subjects, however, might lend legitimacy to the semantic deficit hypothesis of narrative dysfunction.

Recall that the DAT subjects also provided more C-units, but shorter length C-units, in the high content condition relative to normal controls. Although the length of C-units is a rough measure of syntactic complexity, this latter result of reduced sentence length in the more densely packed narratives of DAT subjects suggests that syntactic complexity may also be affected by the narrative stimulus amount. However, combined with the evidence in support of the semantic deficit hypothesis, it suggests that a more strictly linguistic deficit combines with the ideational one to result in poor narrative discourse in DAT patients.

It is plausible that narrative production relies on the contributions of both ideational and semantic-lexical systems. Ideation is responsible for formulating the communication goals of a message and translating it into a discourse plan that include propositional schemas. The semantic-lexical system maps these propositional schemas into linguistic structures. This proposed mechanism 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 are consistent with such a division of processing for both normal elderly and DAT subjects.

Our data must be considered in the light of other studies on narrative production in demented patients. As reflected by fewer target propositions and information units, and reduced efficiency, our DAT subjects generally produced narratives with less content than the normal control subjects. The main finding of reduced content in the narratives of DAT subjects is in agreement with a majority of prior studies (Santo Pietro & Berman, 1984; Hier, Hagenlocker, & Shindler, 1985; Beeson, Bayles, Tomoeda, & Slauson, 1987). The presence of large numbers of sentence fragments and indefinites in their narratives is also in accord with the results of previous studies (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 the results of 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 somewhat divergent findings in the literature with regard to narrative length as well as our findings may be accounted for by both the type of discourse task used to elicit the narrative and the severity of subject’s cognitive-linguistic impairments.

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 discrepancy may also be related to the two factors mentioned above (i.e., dementia severity and type of task). Both the Shekim & LaPointe (1984) and Ulatowska, et al. (1988) studies used relatively early stage dementia subjects who likely exhibited less linguistic pathology.

Also, as argued by Smith, Chenery, and Murdoch (1989) and demonstrated in this study, the complexity of narrative task can influence the verbal production of DAT adults. Indeed, Shekim & LaPointe (1984) showed production differences among various discourse tasks. Specifically, they found that narrative tasks that required telling an integrated story yielded longer sentences than those procedural tasks or 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 in our study may represent the use of a narrative strategy which is more procedural or list-like rather than connected narrative.

In this study the narratives of DAT subjects were also distinguished from those of normal controls by more instances of sentence fragments and indefi-
nites. The findings agree with Nicholas, et al. (1985), Hier, 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 including partial word to phrasal repetitions and revisions and filler words. For example, the utterance “They’re moving the /fur/” was scored as a fragment due to its incompleteness. The likelihood that the subject intended to say “fur” is a remote possibility since no similar error was found for any other subjects and since furniture is such a likely target in the “moving” picture. Such an utterance may signify word finding difficulty. Similarly, the greater number of deictic terms and indefinite nouns for DAT subjects, may indicate a word retrieval impairment. That is, when the subject was unable to supply the target word, the subject may have substituted a more general term for the target word. Clearly, this would reflect a semantic-lexical problem.

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 (Obler & Albert, 1984). For all DAT subjects, reduced efficiency was associated with the use of more reference errors or indefinites and extraneous statements.

The lack of group differences for extraneous statements was surprising since tangentiality has long been considered a discourse symptom of demented subjects (Obler & Albert, 1984). While DAT subjects showed no age-related correlations for extraneous statements, this measure correlated highly with dementia severity rating. Further, this study included several early stage DAT subjects who exhibited relatively mild cognitive-linguistic 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 DAT subjects from normals, as well as from a group of recently diagnosed DAT subjects. It is also possible that tangentiality in narrative production was operationally defined too narrowly in the present study, and thus we might have under-reported 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 which were tangentially related to the narrative were not scored as extraneous statements. Both control and DAT subjects included in

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2 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 unclear reference and perhaps even incomplete sentences.
their narratives such content that was peripherally related to the stimulus story but did not meet the criteria for extraneous statements.

Given the present investigation's findings, the question of determining precisely where the breakdown of narrative production occurs in DAT adults cannot be simply answered. These findings combine to suggest different directions of influence, both semantic-lexical and ideational and perhaps syntactic as well, that merge to produce the pattern of narrative discourse associated with DAT. Since a deficit of the ideational or conceptual system is deemed in part responsible for the narrative production impairment of DAT adults, several questions emerge. It is 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 but they may alternatively operate in modular fashion.

Similarly it is unclear whether the 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 to process than those propositions that provide isolated details about the setting. Or perhaps, does a more general limitation of processing capacity curtail the organization and segmentation of the message into propositions if it exceeds a given amount?

Another question to be addressed concerns the syntactic production of DAT adults. Previous reports have considered it spared, yet we found decreased C-unit length in our DAT patients. This suggests that, while syntax may be correctly produced, the complexity of syntactical constructions is reduced. 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 has been suggested. Alternatively, the apparent syntactic reduction may be related to the competition among limited attentional resources. Perhaps, the greater burden in the informational realm results in a reduced availability of resources for producing complex syntax.

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Appendix A. Examples of Target Propositions in High and Low Content Conditions

I. 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).

II. 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).

Appendix B. Key to Transcription of Coding of Narratives

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 the 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 tol . . . the girl started to run/),
   b. filled pauses (e.g., he paid the. luhl man/),
   c. immediate repetitions (e.g., this is lhis isl some kind of chicken/), and
   d. incomplete clauses resulting from a vacant obligatory object position (e.g., 'Each one has a . . .l, 'lThis is a.l). 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/).
Appendix B. Continued

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) and comments about the task (e.g., that's about all there is to say or this picture is a nice one).

REFERENCES


**CONTINUING EDUCATION**

**Ideational and Semantic Contributions to Narrative Production in Adults with Dementia of the Alzheimer's Type**

**QUESTIONS**

1. The features of language production deficits in adults with dementia of Alzheimer's type include:
   a. Semantic paraphasias
b. Reduced vocabulary
c. Repetitiveness
d. Tangentiality
e. All of the above

2. Production of spoken language by persons in the early stages of dementia of Alzheimer's type resembles:
   a. Anomic aphasia
   b. Wernicke's aphasia
   c. Transcortical sensory aphasia
d. Cluttering
e. Stuttering

3. The findings in the present study revealed that DAT subjects produced narratives:
   a. With more content than expected
   b. With less content than normal subjects
c. That were equivalent to those of normal subjects
d. None of the above
e. All of the above

4. One measure that revealed no differences between groups was:
   a. Efficiency
   b. Extraneous statements
c. Instances of fragments
d. Instances of indefinites
e. Length of utterance

5. In the current study, performance on the Western Aphasia Battery was correlated significantly with:
   a. Fragments
   b. Clauses
c. Indefinites
d. Extraneous statements
e. None of the above