CHAPTER

35

The Effects of Theme Presentation on the Comprehension and Interpretation of Narrative Discourse in Adults with Brain Damage

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This study is part of a larger investigation that examined the effects of delayed narrative theme organization on the comprehension of individuals with right- and left-hemisphere brain damage. Hough and Wilcox (1987) were concerned with whether individuals with brain damage were able to retain information without the aid of a theme and subsequently organize and comprehend this information when the theme was presented at the end of a narrative. In a paragraph comprehension task, subjects with right-hemisphere brain damage produced fewer correct responses and identified fewer central themes when theme presentation was delayed until the end of a narrative than when the theme was presented at the beginning of a narrative. Overall accuracy and central theme identification by subjects with aphasia and non-brain-damaged controls were unaffected by narrative theme organization. Normal subjects performed better on overall accuracy and theme identification than both brain-damaged groups, and subjects with aphasia were more accurate than subjects with right-hemisphere brain damage regardless of theme condition. Only subjects with aphasia were affected by the response condition, showing decreased performance when verbally reporting narrative main ideas as compared to performance on a multiple-choice question response mode. The presentation of a picture depicting the central theme of the narrative had a nonsignificant influence on the performance of all subject groups. The results suggested that individuals with right-hemisphere damage benefit from a theme at the beginning of a narrative more than when it is presented at the end, yet the individuals have relatively poor narrative comprehension skills in either condition. Although adults with aphasia present with compromised linguistic skills, they appear to retain an organizing principle in narrative comprehension.

A few investigations examining comprehension of narrative discourse have revealed performance differences by particular subgroups of adults with left- and right-hemisphere brain damage. Brookshire and Nicholas (1984) found that subjects with dysfluent aphasia did not perform significantly poorer than normal subjects on comprehension of main ideas versus details. Overall comprehension scores of subjects with fluent aphasia, however, were significantly worse than were those of normal subjects. Wapner, Hamby, and Gardner (1981) observed that individuals with fluent aphasia were less accurate in integration and comprehension of narratives and demonstrated more embellishment and confabulation in story interpretations than adults with nonfluent aphasia.

Wapner and colleagues (1981) reported that subjects with right-hemisphere brain damage, as a group, demonstrated decreased performance in integration of narrative discourse as compared to aphasic and normal individuals. However, subjects with anterior right-hemisphere brain damage consistently performed more poorly and confabulated and embellished story interpretations more often than other right-hemisphere groups. Grossman (1982) also observed that adults with anterior right-hemisphere brain damage had more difficulty interpreting linguistic materials presented in noncanonical form than other adults with brain damage.

The present investigation compared the effects of delayed theme presentation on narrative comprehension between subjects with fluent and nonfluent aphasia and normal subjects as well as between subjects with anterior and posterior right-hemisphere brain damage and normal subjects. We specifically were concerned with differences in overall performance accuracy and central theme identification on a paragraph comprehension task. The specific types of errors produced in verbal paragraph interpretations and the relationships among standardized auditory comprehension scores, cognitive functioning level, and experimental task performance were also examined.

METHOD

SUBJECTS

Thirty adults were tested. Ten individuals had right-hemisphere brain damage, with five of these subjects having anterior and five posterior lesions. Ten adults subjects had left-hemisphere brain damage, with five demonstrating fluent aphasia and five demonstrating nonfluent aphasia. Ten adults were non-brain-damaged controls. Subject characteristics are presented in Table 35-1. For all subjects with brain damage, lesions were the result of cerebrovascular etiology, verified by computed tomography (CT) scan and/or clinical examination. All subjects were administered the Raven Coloured Progressive Matrices (RCPM) (Raven, 1956) to determine cognitive functioning. All subjects with brain damage were administered the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1983) to determine the presence or absence of aphasia. In addition, all subjects with brain damage achieved at least 70 percent accuracy on a visual comprehension screening test requiring the identification of nouns and verbs. Fluent and nonfluent groups with aphasia exhibited no statistically significant differences on summated BDAE auditory comprehension subtest scores ($t = 1.330$; $p > .10$).

MATERIALS AND PROCEDURES

The experimental task consisted of 32 paragraphs, a sample of which is presented in Table 35-2. All paragraphs were written so that they were

TABLE 35-1. SUMMARY OF SUBJECT CHARACTERISTICS

	Right hemisphere		*Left hemisphere*		
	Anterior (5)	*Posterior (5)*	*Fluent (5)*	*Nonfluent (5)*	*Normal (10)*
Age					
Mean	61.2	61	66	63.6	59.7
SD	5.630	4.472	5.831	4.393	5.599
Range	54–69	59–68	56–70	58–70	47–67
Education					
Mean	12.6	12.8	13.6	12.8	13.3
SD	2.608	2.280	1.673	2.280	2.003
Range	9–16	10–16	12–16	10–16	11–18
Months post-onset					
Mean	20.4	17	19.6	52.2	
SD	18.770	15.033	17.459	14.516	
Range	5–49	3–40	3–39	31–72	
Comprehension (BDAE)					
Mean	23.6	23.6	21.2	23.4	
SD	1.949	1.673	2.864	2.302	
Range	21–26	22–26	17–25	20–25	
RCPM					
Mean	8.6	11.8	26.6	29.4	32.3
SD	3.209	5.310	2.510	4.615	1.567
Range	5–13	8–20	23–30	24–34	31–35

RCPM = Ravens' Coloured Progressive Matrices.

TABLE 35-2. SAMPLE PARAGRAPHS

NORMAL THEME ORGANIZATION

Mary found a stray dog on the street. At first the dog was afraid of her. He would run away every time Mary would walk toward him. The dog gradually became more friendly. He slowly began to stay in the same room as Mary and let her touch him for a second. Mary was soon able to pet and scratch the dog. The dog began climbing on her lap and falling asleep. Mary decided to ask her mother if she could keep the dog.

DELAYED THEME ORGANIZATION

At first the dog was afraid of her. He would run away every time Mary would walk toward him. The dog gradually became more friendly. He slowly began to stay in the same room as Mary and let her touch him for a second. Mary was soon able to pet and scratch the dog. The dog began climbing on her lap and falling asleep. Mary decied to ask her mother if she could keep the dog. She found a stray dog on the street.

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equivalent with regard to the number of (1) sentences, (2) words per sentence, (3) independent clauses per paragraph, and (4) dependent clauses per paragraph. All paragraphs were at or below a sixth-grade reading level as measured by the Dale-Chall Readability Formula (Dale and Chall, 1948).

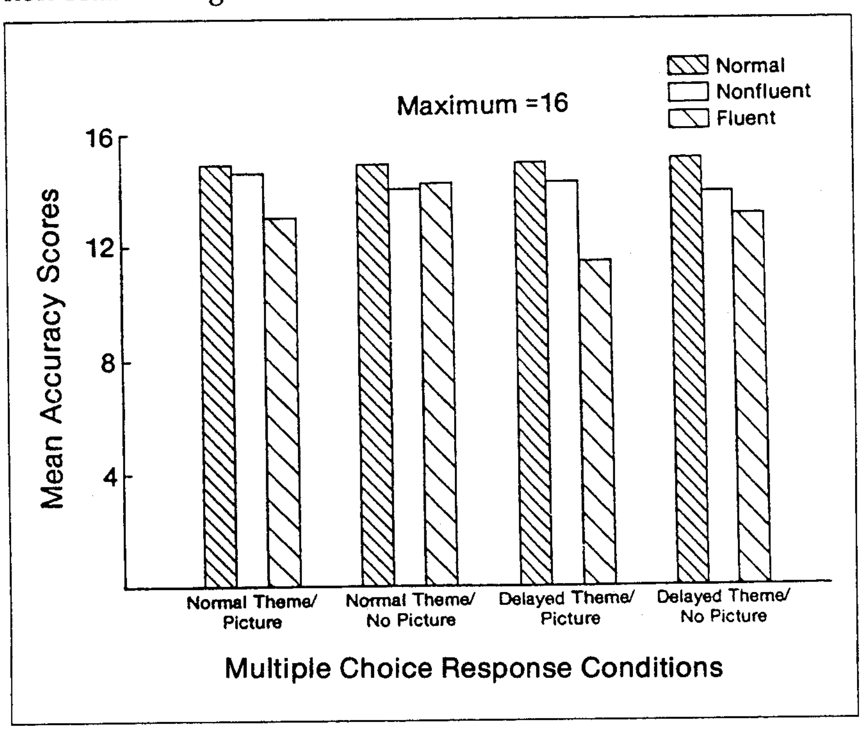
Paragraph main ideas were empirically identified in pilot work with normal middle-aged adults. Fifteen non-brain-damaged individuals were presented with 32 paragraphs in normal theme organization and were asked to identify four main ideas per narrative. The definition of a main idea unit was similar to the one used by Bransford and Johnson (1972) and Thorndyke (1977). In addition, the pilot subjects were asked to rank the main ideas according to their order of importance in regard to presenting the central theme or main idea of the paragraph. The main idea identified as the most salient narrative information by the majority of subjects was designated as the central theme of the paragraph and was manipulated in the organization of the narrative.

Sixteen paragraphs were presented with normal theme organization, and sixteen were presented with theme presentation delayed until the end of the paragraph. All paragraphs were presented auditorily by live voice. Half of the paragraphs were presented with an accompanying picture depicting the narrative theme, and half of the paragraphs were presented without a picture. After the paragraph was presented auditorily, the examiner engaged the subject in 5 minutes of conversation on topics unrelated to the content of the preceding paragraph. The 5-minute conversational delay was inserted to eliminate the possibility of rehearsal and a recency effect. After the delay, a subjects comprehension of the paragraph was ascertained in one of two ways. For half of the paragraphs, subjects were asked to respond by verbally reporting the narrative main ideas. The subjects' responses were audiotaped. For the other half of the paragraphs subjects pointed to one of four words/phrases in response to questions about the narrative. Subjects were asked four questions per paragraph, each of which corresponded to one of the four most salient main ideas of the narrative. Eight versions of the task were developed so that each paragraph could occur in all conditions.

RESULTS

Two four-way ANOVAs with one between (group) and three within (theme organization, picture, response mode) subject variables were conducted to analyze correct responses on the paragraph comprehension task separately for the left- and right-hemisphere brain-damaged groups according to fluency and lesion location, respectively. Data for the groups with aphasia are presented in Figures 35-1 and 35-2 for the multiple-

Figure 35-1. Mean accuracy scores on the multiple-choice response conditions for the groups with aphasia and the non-brain-damaged controls.



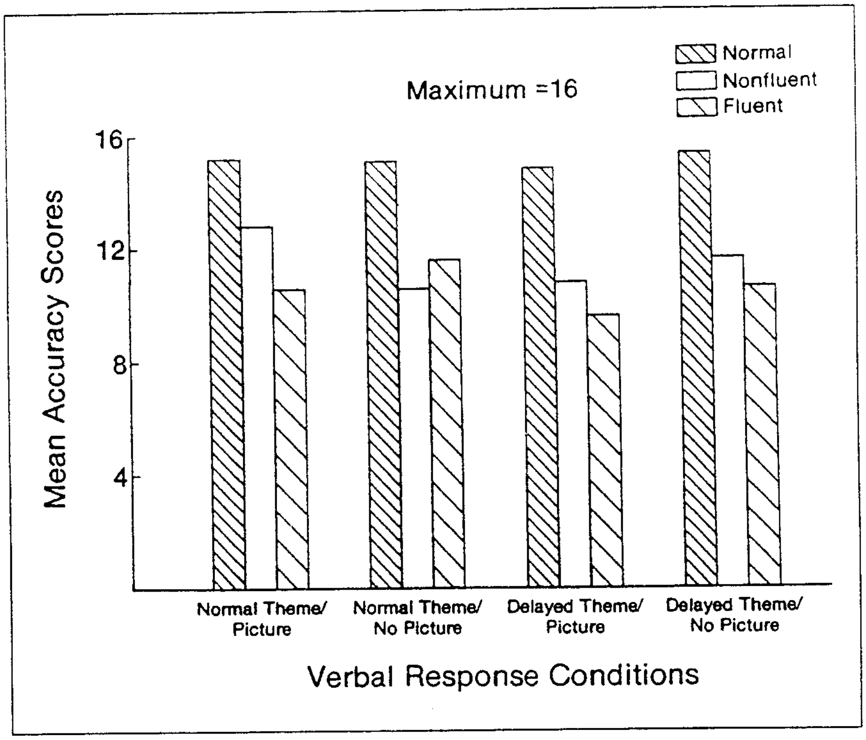


Figure 35-2. Mean accuracy scores on the verbal response conditions for the groups with aphasia and the non-brain-damaged controls.

choice and verbal response modes, respectively. ANOVA information is presented in Table 35-3. For these subjects, Newman-Keuls analyses on a statistically significant group X response interaction ($F = 8.463$; $p < .003$) indicated that both aphasic subgroups were statistically significantly more accurate in the multiple-choice than verbal response mode. Normal subjects performed statistically significantly better than both aphasic groups on the verbal condition but only better than the fluent group on the multiple-choice condition. There were no statistically significant differences between aphasic subgroups in the verbal response mode; however, the nonfluent subjects were more accurate than the fluent subjects in the multiple-choice response condition. No other interactions or main effects were statistically significant.

Data for the subjects with right-hemisphere brain damage are displayed in Figures 35-3 and 35-4 for the normal and delayed theme conditions, respectively. ANOVA information is presented in Table 35-4. Post hoc analyses of the statistically significant four-way interaction ($F = 4.024$; $p < .035$) revealed that both right-hemisphere-damaged groups performed better in the normal theme than the delayed theme condition regardless of picture and/or response condition. Normal subjects were more accurate than both right-hemisphere groups in all delayed theme conditions

TABLE 35-3. SUMMARY OF ANALYSIS OF VARIANCE ON OVERALL ACCURACY SCORES ON THE PARAGRAPH COMPREHENSION TASK FOR THE NORMAL AND LEFT-HEMISPHERE BRAIN-DAMAGED GROUPS

Sources of variance	*df*	*Sums of squares*	*Mean square*	*F*	*p*
Between subjects	19	348.819			
Group	2	321.806	160.903	101.262	<.001*
Group error	17	27.013	1.589		
Within subjects	140	406.612			
Theme	1	6.563	6.563	3.644	.149
Group × theme	2	9.206	4.603	2.566	.106
Error	17	30.613	1.801		
Picture	1	2.102	2.102	2.588	.123
Group × picture	2	5.506	2.753	3.386	.092
Error	17	13.813	.813		
Theme × picture	1	4.622	4.622	3.080	.094
Group × theme × picture	2	3.206	1.603	1.068	.367
Error	17	25.513	1.501		
Response	1	95.063	95.063	23.082	<.001*
Group × response	2	69.706	34.853	8.463	.003*
Error	17	70.013	4.118		
Theme × response	1	.023	.023	.021	>.500
Group × theme, × response	2	.506	.253	.238	>.500
Error	17	18.113	1.065		
Picture × response	1	.303	.303	.292	>.500
Group × picture, × response	2	.356	.178	.172	>.500
Error	17	17.613	1.036		
Theme × picture, × response	1	2.403	2.403	1.458	.242
Group × theme, × picture, × response	2	3.356	1.678	1.018	.384
Error	17	28.013	1.648		

* $p < .05$.

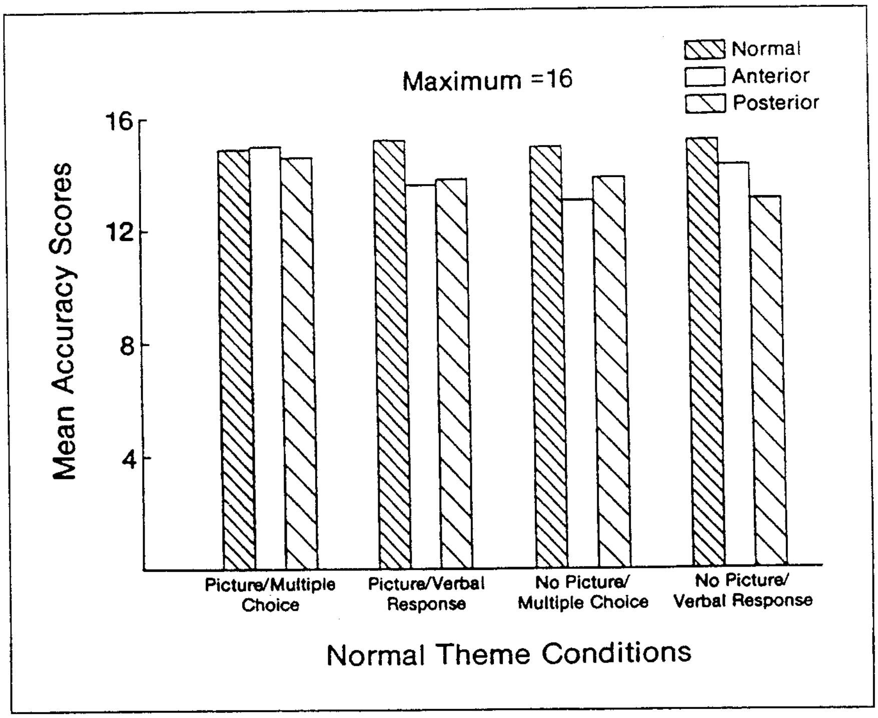


Figure 35-3. Mean accuracy scores on the normal theme conditions for the groups with right-hemisphere brain damage and the non-brain-damaged controls.

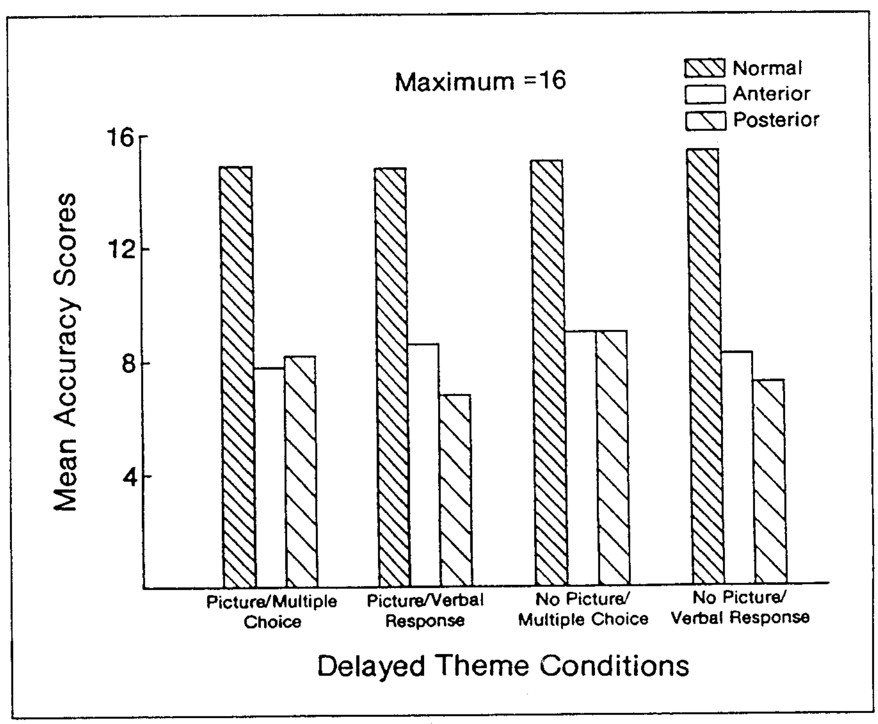


Figure 35-4. Mean accuracy scores on the delayed theme conditions for the groups with right-hemisphere brain damage and the non-brain-damaged group.

TABLE 35-4. SUMMARY OF ANALYSIS OF VARIANCE ON OVERALL ACCURACY SCORES ON THE PARAGRAPH COMPREHENSION TASK FOR THE NORMAL AND RIGHT-HEMISPHERE BRAIN-DAMAGED GROUPS

Sources of variance	*df*	*Sums of squares*	*Mean square*	*F*	*p*
Between subjects	19	644.126			
Group	2	608.713	304.356	146.108	<.001*
Group error	17	35.413	2.083		
Within subjects	140	959.382			
Theme	1	490.623	490.623	423.111	<.001*
Group × theme	2	302.513	151.256	130.443	<.001*
Error	17	19.713	1.160		
Picture	1	1.103	1.103	1.274	.247
Group × picture	2	2.638	1.319	1.524	.245
Error	17	14.713	.865		
Theme × picture	1	4.203	4.203	6.100	.023*
Group × theme, × picture	2	.938	.469	.680	>.500
Error	17	11.713	.689		
Response	1	4.622	4.622	2.478	.131
Group × response	2	10.013	5.007	2.684	.093
Error	17	31.713	1.865		
Theme × response	1	.723	.723	.792	.390
Group × theme, × response	2	1.113	.556	.610	>.500
Error	17	15.513	.913		
Picture × response	1	.063	.063	.084	>.500
Group × picture, × response	2	1.038	.519	.699	>.500
Error	17	12.613	.742		
Theme × picture, × response	1	5.063	5.063	4.411	.049*
Group × theme, × picture, × response	2	9.238	4.619	4.024	.036*
Error	17	19.513	1.148	4.024	.036*

*$p < .05$.

and two of the four normal theme conditions. There were no statistically significant differences between the two right-hemisphere groups.

The number of narratives for which subjects provided and/or chose the most central theme were analyzed in two 3-way ANOVAs with one between (group) and two within (theme organization, response mode) subject variables. Left-hemisphere and right-hemisphere data were examined separately. The picture variable was omitted from these analyses, as it had a statistically nonsignificant effect on all groups in the overall accuracy analyses. Data for the left-hemisphere groups on central theme identification are presented in Table 35-5. For the left-hemisphere subjects, a statistically significant group × response ($F = 14.421$; $p < .001$) interaction revealed that both groups with aphasia identified more central themes in the multiple-choice than the verbal response condition, with no statistically significant difference between response conditions for the normal subjects. Normal subjects produced statistically significantly more central themes than the fluent subjects regardless of response condition and more than the nonfluent subjects only in the verbal response condition. In contrast to overall accuracy findings, the results for central theme identification revealed no statistically significant difference between the two aphasic groups in the multiple-choice condition, but the nonfluent subjects identified more central themes than the fluent subjects in the verbal response mode.

Central theme data for the groups with right-hemisphere brain damage are presented in Table 35-6. For these subjects, a statistically significant group × theme interaction ($F = 17.458$; $p < .001$) indicated that both right-hemisphere groups identified more central themes in the normal theme condition and normal subjects identified more central themes than both right-hemisphere groups regardless of theme condition. There were no differences between right-hemisphere groups, and there were no differences between theme conditions for the non-brain-damaged subjects.

TABLE 35-4. MEAN CENTRAL THEME ACCURACY SCORES FOR THE NORMAL AND APHASIC GROUPS BY RESPONSE CONDITION

	Normal	*Nonfluent*	*Fluent*
Multiple-choice			
Normal theme	7.3* (0.823)†	6.8 (1.095)	6.8 (0.837)
Delayed theme	7.5 (0.707)	6.8 (0.837)	5.8 (1.304)
Verbal response			
Normal theme	7.5 (0.707)	4.0 (1.581)	4.6 (1.140)
Delayed theme	7.1 (0.876)	5.4 (0.894)	3.6 (0.548)

* Maximum score equals 8.
† Standard deviations are in parentheses.

TABLE 35-6. MEAN CENTRAL THEME ACCURACY SCORES FOR THE NORMAL AND RIGHT-HEMISPHERE GROUPS BY THEME CONDITION

	Normal	*Anterior*	*Posterior*
Normal theme			
Multiple choice	7.3* (0.823)†	6.0 (0.707)	4.8 (0.836)
Verbal response	7.5 (0.707)	5.4 (1.140)	5.4 (1.340)
Delayed theme			
Multiple-choice	7.5 (0.707)	3.0 (1.225)	2.4 (0.890)
Verbal response	7.1 (0.876)	2.4 (0.548)	2.8 (1.095)

* Maximum score equals 8.
† Standard deviations are in parentheses.

Errors committed on the verbal response condition were categorized into repetitions, embellishments, and confabulations. Data analyses were based on the total number of responses produced. Error data for all groups are presented in Table 35-7. An ANOVA with one between (group — left, right, normal) and two within (theme organization, error type) subject variables on the number of specific errors revealed statistically significant group × theme ($F = 15.703$; $p < .001$) and group × error type ($F = 5.538$; $p < .001$) interactions. Newman-Keuls analyses on the group/theme interaction demonstrated that only right-hemisphere subjects showed a statistically significant difference between theme conditions, producing more errors in the delayed theme condition and producing more errors than the other groups regardless of theme condition. Further investigation of the right-hemisphere group revealed that the subjects with anterior damage produced statistically significantly more errors than the posterior and normal subjects and subjects with posterior damage produced more errors than the normal subjects regardless of theme condition ($F = 15.699$; $p < .001$). Not surprisingly, both right-hemisphere groups produced more errors in the delayed theme than normal theme condition, with no difference for the normal subjects.

The statistically significant group/error type interaction revealed that right-hemisphere subjects produced significantly more embellishments and confabulations than the left-hemisphere and normal subjects and the left-hemisphere subjects produced more of these errors than the normal subjects. However, whereas the right-hemisphere subjects produced statistically significantly more confabulations than any other error type, the left-hemisphere group produced more repetitions than any other error type. Additional analyses of the right-hemisphere group revealed that the subjects with anterior damage produced statistically significantly more

TABLE 35-7. MEAN NUMBER OF SPECIFIC ERRORS IN VERBAL RESPONSE CONDITION FOR ALL GROUPS

	Left hemisphere		*Right hemisphere*		
	Fluent	***Nonfluent***	***Anterior***	***Posterior***	***Normal***
Normal theme					
Repetitions	5.6 (3.578)*	4.8 (3.834)	4.6 (1.140)	4.6 (2.408)	3.8 (1.751)
Embellishments	6.4 (3.050)	1.4 (1.673)	5.2 (0.837)	3.4 (1.949)	2.4 (1.647)
Confabulations	3.4 (2.881)	1.8 (1.304)	5.8 (1.304)	4.6 (2.302)	0.7 (0.823)
Delayed theme					
Repetitions	4.2 (2.864)	5.8 (3.114)	5.4 (0.894)	5.4 (0.894)	3.7 (1.252)
Embellishments	8.0 (6.000)	1.6 (1.817)	9.4 (0.894)	7.2 (1.483)	2.3 (1.337)
Confabulations	4.8 (4.207)	1.6 (1.342)	10.8 (1.483)	6.4 (2.302)	1.1 (1.101)

* Standard deviations are in parentheses.

confabulations and embellishments than the normal and right-posterior groups, and right-posterior groups produced more of both of these error types than normal subjects ($F = 20.933$; $p < .001$). For the left-hemisphere group, fluent individuals produced statistically significantly more embellishments than the nonfluent and normal adults and more confabulations than the normal group ($F = 4.608$; $p < .005$). Whereas nonfluent subjects produced more repetitions than embellishments and confabulations and normal subjects produced more repetitions than embellishments, subjects with fluent aphasia produced statistically significantly more embellishments than the other two error types.

Pearson product-moment correlations were calculated for the right- and left-hemisphere subject data between age, education, months post-onset, BDAE auditory comprehension scores, RCPM performance, and normal and delayed theme scores on the experimental task. For both the right- and left-hemisphere subject data, the only statistically significant finding was a positive correlation between delayed theme performance and RCPM scores ($r = .932$ and $r = .892$, respectively).

DISCUSSION

The findings for the right-hemisphere brain-damaged groups support our previous results (Hough and Wilcox, 1987). Regardless of lesion location, right-hemisphere brain-damaged individuals demonstrate difficulty integrating discourse into a coherent narrative, particularly when information is presented in an unexpected format (e.g., delayed theme). We found, as did Wapner and colleagues (1981), that subjects with anterior right-hemisphere brain damage produced more embellishments and confabulations in narrative interpretation than posterior right-hemisphere brain-damaged adults. These findings were influenced by theme organization, with a statistically significant increase in error production for both right-hemisphere groups when theme presentation was delayed.

Our results are in agreement with Brookshire and Nicholas (1984) in regard to fluency of the left-hemisphere subjects. Both investigations found that fluent subjects performed more poorly than nonfluent and normal individuals. This was of interest, particularly in the present study, because there were no statistically significant differences between the two aphasic groups on BDAE auditory comprehension performance and there were no statistically significant relationships between BDAE comprehension scores and experimental task performance. These findings are in agreement with other researchers (Hough, Pierce, and Cannito, 1989; Wilcox, Davis, and Leonard, 1978) who have suggested that standard auditory test batteries do not adequately reflect aphasic individuals' receptive abilities in more natural linguistic settings.

The two groups with aphasia showed different patterns in the types of errors they produced. Subjects with nonfluent aphasia produced statistically significantly more repetitions than other error types, displaying an error pattern similar to the non-brain-damaged controls. Error performance of the fluent group was more similar to the subjects with right-hemisphere brain damage, producing statistically significantly more embellishments than other error types. These results support those of Wapner and colleagues (1981). Our adults with fluent aphasia, however, appeared to differ from the groups with right-hemisphere brain damage in that the fluent subjects primarily add elements to a narrative or make extraneous comments to normalize discourse. The groups with right-hemisphere brain damage, particularly those with anterior lesions, on the other hand, engage in sheer confabulation as frequently as they embellish. These subjects invent and subsequently justify major elements in their interpretations.

The clinical implications of our research can be derived by examining the flow of information in normal discourse. Contextual or supportive information may be presented after related target information, particularly when a speaker wants to clarify something that already has been said in a conversation or narrative. Clarification may enhance previously heard statements or promote comprehension of information by providing the central theme of the discourse. Adults with right-hemisphere brain damage, particularly those with anterior lesions, may be impaired in the integration of information in conversation/narration, especially when an organizing theme does not occur at the beginning of the narrative. These individuals may change or add information in their interpretations/responses in an attempt to compensate for their inability to apprehend discourse. However, an alternative explanation for their performance may be that individuals with right-hemisphere brain damage expand on information in such a manner that it does not relate to the integrated meaning of the discourse, thereby appearing as embellishment or confabulation. This behavior is more prevalent in anterior than posterior right-hemisphere lesions. Adults with aphasia, especially nonfluent individuals, appear to integrate all semantic information prior to determining meaning of a narrative without regard to the order of this information (Pierce, 1989). Fluent individuals may perform more poorly than other aphasic adults because they have some difficulty with the integration of information.

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DISCUSSION

Q = question; A = answer; C = comments.

Q. I want to ask you a question about a detail, and I'll understand if you don't remember. I'm asking this because I think some people feel that certainly a dominant process related to narrative comprehension is inferencing, especially related to theme and related to context, that inferencing may be identical to some reasoning processes. I want to know how your right-hemisphere folks did on the Ravens, whether there were some who had specific problems with the difficult reasoning items versus the pure visual matching and so on. Do you recall or have a sense of what happened there?

A. I don't have that information offhand, but in general I was extremely surprised at how poorly the right-hemisphere patients did on the

Ravens. I tested individuals who were relatively intact in regard to carrying on an in-depth conversation but yet had overall scores of six on the entire Ravens. So I don't think they did very well on any of the test.

C. You said there was a significant correlation.

A. That is a very interesting finding for which I'm just beginning to draw some conclusions in regard to interpretation. There was a significant correlation between Ravens' performance and performance for both the left- and right-hemisphere groups in the delayed theme condition. I think we are tapping something that is very "cognitive" there in general as opposed to a more cognitive/linguistic process for both groups. The higher the Ravens' peformance, the better they performed in the delayed theme condition. Individuals have argued about what the Ravens is testing. We find a high correlation between intelligence and Ravens' performance. Kertesz observed this in the 70s even for aphasic patients. What are we tapping in the correlation with the delayed theme organization — what are we looking at? Are we examining something different from these narrative level difficulties that right-hemisphere patients have when the theme organization is in a normal format? Are we even tapping something at a higher cognitive level, if that's possible, when we place the theme at the end of a narrative in regard to reasoning/inferencing? I'm just not sure about this issue.

C. I think it would be interesting to examine the Ravens' data in more detail.

A. One other point, in regard to eyeballing the Ravens' data between the anterior and posterior right-hemisphere patients: The posterior patients appeared to do a bit better as a group, which surprised me in terms of administering a visual/perceptual task such as when we're using the Ravens. A t-test between the two subgroups' performance, however, revealed no significant difference on the Ravens.