The influence of narrative structure on memory

GREGORY E. MONACO and RICHARD J. HARRIS
Kansas State University, Manhattan, Kansas 66506

Subjects read the same information embedded at different hierarchical levels in four stories about political and economic strife on a small island and then performed a series of memory and rating tasks about the material they had read. Results showed that, overall, subjects recalled and recognized identical information equally well no matter which version they had read, in spite of great differences in the narrative structures and great differences in length, and gave them substantially the same ratings on several scales. Thus, contrary to results reported by others (e.g., Kintsch & van Dijk, 1975; Meyer, 1977; Rumelhart, 1976), there was no support for a narrative theory hypothesis that the hierarchical depth of information in the narrative structure determines memory for that information.

Recent research studying the narrative schema through which the reader interprets stories (e.g., Bower, 1976; Frederiksen, 1975; Kintsch & van Dijk, 1975; Meyer, 1975, 1977; Rumelhart, 1976; Thorndyke, 1977) has suggested that a hierarchical structure of the events in these stories exists comparable to a tree structure for sentences. Although there is some disagreement on the details of the formal description, it has generally been found that the narrative schema enables people to readily interpret and remember the major propositions in simple stories.

Simply, the narrative is seen as consisting of episodes which, in turn, consist of expository statements introducing characters and locales, statements of the conflict, and statements of the resolution. Any of these statements may introduce a new episode for embedding into the larger narrative. Episodes and statements may be considered higher in level when they introduce new information and lower in level when they elaborate upon the already presented information. An unnecessary, yet explicit, assumption of the grammars of Kintsch and van Dijk, Bower, Rumelhart, and others is that the higher the level of the statement or episode in the structural hierarchy, the more likely it is to be remembered.

While much of the research reported by narrative grammarians has supported the notion that higher level information is more easily remembered, there may be a methodological problem: Level of information is typically a within-subjects factor and the specific information itself is often not counterbalanced between levels. This violates a fundamental principle of experimental design and thus interferes with determining whether memory differences are truly a function of

hierarchical level of information in the narrative or rather an artifact of the particular text attributes per se; that is, if that information were higher in the narrative schema, it still might not be recalled because it is inherently relatively dull, nonimageable, uninteresting, etc.

Only Meyer (1975, 1977) has carefully controlled for the same content appearing at different hierarchical levels. Although she manipulated the structural position of a target paragraph between versions of a passage, her results do not rule out the hypothesis that information lower in the structure of a passage is remembered as well as information higher in the structure, but does not appear to be remembered as well under free recall conditions. Thus, Meyer's results (as she points out, Meyer, 1977) are most relevant to conditions of immediate recall. They have not been tested in recognition-memory tasks. Should no differences between structural level be found in a recognition-memory task, many of her conclusions would be cast in doubt.

The present research was designed to replicate Meyer's design, but using a variety of dependent measures, employing a between-subjects design in which the same information (a series of episodes) occupied different structural positions, ranging from the main plot to an entirely subsidiary role, in four narratives. These episodes were chosen because they are similar, if not identical, to those used in other experiments (e.g., Thorndyke, 1977), where differences in recall due to hierarchical structure were reported. Protocols could therefore be analyzed in the same manner as those of narrative theorists, many of whom have found differences due to hierarchical structure. This was expected to reduce the probability of bias to accept the null hypothesis.

EXPERIMENT 1

Method

Subjects. The subjects were 72 undergraduate psychology students from Kansas State University who participated in the

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experiment to either fulfill a course requirement or to earn extra credit points. They were tested in groups, with each subject working individually.

Materials. The prose materials were four narratives based on the Circle Island passage first used by Dawes (1966). This story relates the happenings on a fictional mid-Atlantic island caught in a struggle between the farmers and ranchers over the proposed construction of a cross-island canal for irrigation. The Basic story used was similar to the abridged version used by Thorndyke (1977), in which the happenings were stated clearly and succinctly but with minimal detail. The Protagonist-Noninteract story was essentially the same but reported as from a newspaper story by someone named John. The major difference between the Basic and Protagonist-Noninteract stories was the frequent appearance in the latter of expressions like "John reported" and "continued John," under which the Basic story was embedded, representing the subsidiary relationship between the key episodes and John's reporting. The third story, the Protagonist-Interact, was similar to the Protagonist-Noninteract except that the reporter John was himself involved in the action of the story (e.g., as a partisan of the farmers in the canal struggle). The story is the same in all three versions and John is mentioned the same number of times in the Protagonist-Noninteract and Protagonist-Interact versions. However, the key episodes are subsidiary to John's actions. The last version of the story, the Protagonist-Enhanced, was far longer than the other three. It too contained the same basic story, but that story was subsidiary to a new plot involving John's developing relationship with a girl named Margarita, who accompanied him on his reporting and lobbying adventures, the latter of which were basically the same as in the Protagonist-Interact version. The John-Margarita plot was developed in detail and dominated the farmer-rancher plot, frequently introducing only one fact from the Basic story in the context of the John-Margarita plot. It did not, however, alter the events of the former, which were identical in all four versions of the story.

There were 42 critical propositions which appeared once in each story and were worded identically in all four versions, although the stories differed in the hierarchical placement of these propositions. This methodology allowed scoring of the same propositions across the different groups. The lengths of the four stories were 258, 302, 389, and 1,451 words for the Basic, Protagonist-Noninteract, Protagonist-Interact, and Protagonist-Enhanced versions, respectively.

Procedure. All subjects were told initially that they would be given a story to read and later asked to evaluate it. Each subject then received a typewritten copy of one of the four versions of the story. As each subject in the session finished reading the story, he/she handed it back to the experimenter, who then administered the free recall task, giving instructions to write as much of the story as remembered in as close to verbatim form as possible. In a rating task immediately following, subjects rated the story on a 1-7 scale on the dimensions of vocabulary difficulty, comprehensibility, amount of detail, interest of author's style, organization of thought, grammar, originality, and interest of plot. Immediately after this task, the subjects received a filler task; they were asked to write a brief summary of the story as if they were telling it to someone who had not heard it before. At the conclusion of the summary task, they received the final task, recognition memory. On this forced-choice task they received a booklet with 16 sets of six sentences each. Each set contained one of the critical propositions as it appeared verbatim in all four versions of the story (e.g., *The Senate was dominated by ranchers*), in addition to five distractors. One distractor was a simple syntactically transformed sentence with no change in meaning or substantive lexical items from the target sentence (e.g., *Ranchers dominated the Senate*). A second distractor also kept the same meaning but changed the surface-structure syntax and some lexical items, that is, it was a paraphrase (e.g., *Livestock interests controlled the legis-*

lature). The other three distractors involved a substantive semantic change and its surface-structure and paraphrase variants (e.g., *The Senate was dominated by farmers*, *Farmers dominated the Senate*, *Food interests controlled the legislature*). The subjects were asked to check the one sentence in each set that was exactly what they had read in the story. The sentences within each set of six were in a random but constant order for all subjects; the sets appeared in the same order as the corresponding target sentences had appeared in the story.

The subjects were tested in small groups, going through the reading and response tasks at their individual rates of speed.

Results

Free recall. The free recall protocols were scored as to whether they contained each of the 42 critical propositions on the previously prepared list of propositions. This list was similar, but not identical, to Thorndyke's (1977) propositional analysis, where information in a similar story was quantified into idea units. No attention was paid to surface structure or lexical-item choice; any response containing substantially the same information that occurred in a given proposition was given credit for that proposition. Each of the experimenters scored half of the free recall protocols within each story group, as an additional control for individual scorer differences.

The mean numbers of critical propositions correctly recalled were 21.28, 20.22, 19.00, and 12.50 for the Basic, Protagonist-Noninteract, Protagonist-Interact, and Protagonist-Enhanced groups, respectively. A one-way analysis of variance treating both subjects and items as random factors was performed on the mean number of critical propositions correctly recalled by each group and revealed a significant $F_1(3,68) = 4.52$, $F_2(3,123) = 33.86$, $\min F'(3,86) = 3.97$, $p < .025$. Post hoc tests revealed that the Protagonist-Enhanced group recalled significantly fewer critical propositions than any of the other three groups, which did not differ from each other.

Ratings. Mean ratings for each of the seven scales appear in Table 1. One-way analyses of variance were performed for each, treating subjects as a random factor. Only the means for comprehensibility [$F(3,86) = 2.77$, $p < .05$] and amount of detail [$F(3,68) = 5.08$, $p < .01$] were significant. Newman-Keuls tests revealed that for comprehensibility only the Basic and Protagonist-Enhanced groups differed significantly at the .05 level. For the detail rating, the Basic group differed significantly from the Protagonist-Noninteract (.05 level) and Protagonist-Enhanced (.01 level) groups, with the longer stories, not surprisingly, being rated as more detailed.

Recognition memory. The subjects' responses on the recognition-memory task were scored as no meaning change (correct, syntactic transformation, or paraphrase) or meaning change (no surface change, syntactic transformation, or paraphrase). The data are presented in Table 2. As is apparent, the large majority (89.7%) of responses retained the meaning, and there were no significant differences in the number of correctly recog-

nized sentences as a function of the type of story read.

Discussion

In spite of the free recall memory decrement in the Protagonist-Enhanced group, similar to that found by Meyer (1975), and the differing lengths of the passages, all four groups remembered the Basic story equally well on the recognition-memory task. Thus, the occurrence of key episodes at lower levels of the narrative hierarchy in the Protagonist-Enhanced passage did not depress memory on this task.

EXPERIMENT 2

Subjects in the Protagonist-Enhanced group recalled significantly fewer propositions than subjects in the other three groups, but the four groups did not differ on the later recognition-memory task, indicating that, contrary to Meyer's (1977) conclusions, structural position may not be the major determinant of what is remembered. It is clear that the free recall task did not tap nearly all of the subjects' basic knowledge remembered about the Circle Island story. Presumably this was due to the self-imposed constraints under which subjects worked; that is, attempting to recall all of the Protagonist-Enhanced passage may have appeared insurmountable to subjects and thus they failed to report all they remembered. Further, the differences in passage length made the free recall task qualitatively different across the four groups. Thus, Experiment 2 was conducted using a different recall measure, specific content questions to be answered in single words or short answers.

The rating task data may have been seriously confounded in Experiment 1 because of the serial position of this task in the response task sequence. Subjects were asked to evaluate the story on several scales, many of which would tend to be highly correlated with general positive affect. Yet this task always followed the free recall task, which was in some sense a very different task for the different groups. Specifically, because of the greatly increased story length, it was far more tedious for the Protagonist-Enhanced group. Thus, some of the

ratings on the subsequent task may have been artificially depressed by the intervening dull task. The rating task was readministered in Experiment 2 but was given immediately after subjects read the story, before any memory assessment was made.

Method

The method for Experiment 2 was identical to that in Experiment 1 with the following exceptions: (1) There were a total of 40 subjects, each of whom read one of the four stories, with 10 subjects reading each story. (2) There were three response tasks administered in the following order: rating, completion, and recognition memory. The rating and recognition-memory tasks were exactly the same as those in Experiment 1. The completion task involved a series of 26 questions about the story for which the subject had to fill in the answer. These questions asked about events in the Basic story which appeared in the same wording in all four passages. This task, essentially a modified cued recall procedure, was employed in order to use a more sensitive recall measure than the free recall task used in Experiment 1.

Results

The results from the rating task appear in Table 1. On none of the dimensions do the means differ significantly from each other as a function of story type.

The recognition-memory task totals appear in Table 2. As in Experiment 1, there were no differences in number of correct recognitions as a function of story.

The completion task was scored by the two experimenters and a research assistant deciding in advance on acceptable responses to each of the questions. There were 32 possible points, with some questions receiving 2 points of credit. The mean numbers of correct responses were 24.50, 26.20, 27.20, and 23.80 for the Basic, Protagonist-Noninteract, Protagonist-Interact, and Protagonist-Enhanced groups, respectively; these means did not differ significantly [$F(3,36) = .95$].

Discussion

Thus, the completion task has been shown to be a more sensitive recall measure than the free recall task used in Experiment 1 and the decrement in the Protagonist-Enhanced group on the free recall task must be considered a task artifact. Subjects

Table 1
Mean Ratings

	Story							
	Basic		Protagonist-Noninteract		Protagonist-Interact		Protagonist-Enhanced	
	1*	2*	1	2	1	2	1	2
1. The vocabulary in the paragraphs was (easy 1 . . . 7 difficult)	2.22	1.80	2.17	1.90	1.94	1.80	2.67	2.30
2. I understood (little 1 . . . 7 everything) of what the author was saying	6.06	6.60	5.89	6.10	5.72	5.70	4.61	5.70
3. There was too (little 1 . . . 7 much) detail in the paragraphs	3.44	3.70	4.50	3.50	3.94	4.40	4.94	4.70
4. The author's style of writing was (dull 1 . . . 7 interesting)	3.67	3.80	3.67	3.80	3.44	3.20	3.56	3.90
5. The author showed (poor 1 . . . 7 good) organization of thought	3.94	5.50	4.17	4.80	4.67	4.20	3.17	3.70
6. The grammar of the paragraphs was (poor 1 . . . 7 good)	5.22	5.30	4.61	4.20	5.06	5.10	4.39	4.40
7. The author demonstrated (little 1 . . . 7 much) originality of thought	3.72	3.20	2.83	4.00	3.39	3.80	3.50	3.50
8. The plot was very (dull 1 . . . 7 interesting) to me	4.50	3.90	4.00	4.50	3.22	3.00	3.44	3.80

*1 = Experiment 1; 2 = Experiment 2.

Table 2
Number of Responses on Recognition-Memory Task

Response	Story									
	Basic		Protagonist-Noninteract		Protagonist-Interact		Protagonist-Enhanced		Total	
	1*	2*	1	2	1	2	1	2	1	2
No Meaning Change										
Correct	177	114	161	85	154	108	157	92	649	399
Syntactic Transformation	65	26	74	45	80	35	61	39	280	145
Paraphrase	20	9	29	14	26	9	29	16	104	48
Meaning Change										
No Surface Change	11	3	11	6	10	5	17	2	49	16
Syntactic Transformation	5	5	7	5	11	2	15	7	38	19
Paraphrase	10	3	6	5	7	1	9	4	32	13

*1 = Experiment 1; 2 = Experiment 2.

hearing any of the four versions of the story could recall and recognize the Basic story material equally as well on subsequent tasks.

GENERAL DISCUSSION

The results of Experiments 1 and 2 indicate that there is no reason to believe that the position of information in the grammatical hierarchy of a narrative passage in and of itself predicts the probability of remembering that information. This finding was obtained for both recognition and cued recall tasks, with a difference on a free recall task in Experiment 1 being a task artifact—a hypothesis even Meyer (1977) has entertained.

In spite of using very similar materials, these results are at variance with those reported by narrative grammarians such as Kintsch and van Dijk (1975), Rumelhart (1976), and Thorndyke (1977) which seemed to support the notion that location of information within the narrative hierarchy predicts whether or not that information will be remembered. However, those studies were methodologically flawed by confounding saliency of information with hierarchical level and by neglecting to counterbalance information across structural levels. Thus, the results reported elsewhere are highly questionable.

Any description of story comprehension must take into account the role of the comprehender; his/her efforts, especially in terms of attention, also determine how much or how little information will be remembered. In the present investigation, an interactive effect of narrative structure and comprehender effort may have occurred, leading to better memory. For example, in the Protagonist-Enhanced group it may have been the case that the main plot facilitated a deeper level of processing

of the Basic story or held the subjects' attention better, attenuating what might otherwise have been a memory decrement, due to increased amount of stimulus material and/or lower hierarchical level of the critical information.

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