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IMAGINATION IN STORY READING: THE ROLE OF IMAGERY, VERBAL RECALL, STORY ANALYSIS, AND PROCESSING LEVELS

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ABSTRACT

The spontaneous use of imagery and its relationship to free verbal recall were investigated. Community college students read a 2,100-word story under one of three sets of instructions and then recalled the story and reported their images immediately and 48 hours later. A new methodology for classifying imagery reports was developed. Results indicated that separate categories of imagery reports and verbal recalls were not highly correlated. Principal components analysis yielded factors predominated by imagery variables. Further, whereas total verbal recall declined over the retention interval (i.e., forgetting), imagery did not. Experimental instructions to readers designed to manipulate processing depth in an externally valid fashion did not result in significant differences in imagery reporting and recall, suggesting that a strict levels of processing view may be untenable for ecologically valid reading situations. Other results indicated that a significant relationship existed between imaging a story segment and the story grammar macrostructure of that segment, and that imagery of the climactic event was the most common. This study contributes to a series of studies using various texts and methodologies that suggest that imagery is a distinctive aspect of reading, viable for study in its own right.

During the last twenty years, mental imagery has become a topic of increasing interest to cognitive researchers, to the extent that it is "one of the hottest topics in cognitive science" (Block, 1981, p. 1). Led by Paivio (1971, 1986), Shepard (1978), Kosslyn (1980), and others, the study of imagery in cognition has risen from the status of a secondary or "epiphenomenal" mental process to one which

rivals propositional network theories as a basis of cognition. Indeed, the theorist Ernst Hilgard (1981) has concluded: "Arguments can go on about the extent to which thought uses images and uses propositions, but the role of images can no longer be ignored, even though they need not carry the whole burden of the explanation of thought" (p. 19). However, only a few researchers of cognition in reading have investigated the use of imagery as a basic process, and those researchers have primarily treated imagery as a strategy requiring training and/or assignment as an experimental condition. The study of the spontaneous use of imaginative processes in reading, although of great intuitive appeal, has received insufficient attention.

The study of spontaneous imaginative responses in reading may be especially central to understanding the way we experience or "live through" literature. Imagination in reading involves the power of reproducing images stored in memory under the suggestion of associated language or of recombining former experiences to create new images that vitalize and animate the text. This study was a broad effort to explore the role of imaging in reading by connecting the new with the known or assumed; that is, to see how imagery behaves in relation to more extensively researched cognitive performances in the areas of verbal recall, story analysis, and levels of processing. Borrowing theoretical paradigms from these areas, we attempted to find bridges to understanding spontaneous imaginative processes.

This study builds on the beginning that has been made in the study of spontaneous mental imagery in reading. Studies by Sadoski (1983, 1985), Sadoski, Goetz, and Kangiser (1988), Long (1986), Wingenbach (1983), Cioffi (1986), and others have demonstrated that when students of various ages read stories, they report mental images without instructions to image. Good readers report using numerous and elaborate images as a normal reading strategy (Cioffi, 1986; Wingenbach, 1983). Readers report images for a variety of text features in both narrative and expository genres (Long, 1986). Reported images tend to relate to important parts of stories (Long, 1986; Sadoski, 1983, 1985; Sadoski, Goetz, & Kangiser, 1988), with reported imagery of the story climax being associated with overall recall and the ability to identify a defensible theme for the story (Sadoski, 1983, 1985).

A consistent finding in these studies is that imagery variables do not correlate highly with verbal measures such as standardized intelligence, vocabulary, and reading comprehension tests, or passage-based tests such as multiple choice, cloze, or most oral retelling scores. Where significant correlations do exist, imagery is associated only with comprehension and recall variables associated with deeper levels of processing, such as comprehension of the story's plot and theme. These researchers have concluded that imaginal processes have functional characteristics that distinguish them from verbal, linguistic processes (cf. Paivio, 1971, 1986). That is, imagery and verbal processes are basically separate processes that integrate in the full reading experience.

The purpose of this study was to further these findings through an intensive analysis of imagery and verbal variables in the reading of a complete literary work.

Also, several aspects of the study advanced previous research on the spontaneous use of imagery.

First, no complete and reliable system for categorizing naturally occurring imagery reports was available that permits the comparision of these responses with traditional categories of free verbal recall. Therefore, a complete system for categorizing imagery report data was developed and employed here.

Second, imagery reports and free recalls of the story were collected both immediately and 48 hours after reading. This allowed for analysis of similarities and differences in the retention of imaginal and verbal information over time. No previous study has analyzed the relationship between reported imagery and verbal recall in this manner, and such an analysis provides for a more extended and in-depth comparison.

Third, the story was analyzed according to story grammar rules, and reported imagery for story segments was related to the segments' macrostructures. Although some prior research has related imagery to certain text structure features (e.g., climactic points), no previous studies have related naturally occurring imagery to story grammars.

Finally, the reading task, as described in the initial instructions to subjects, varied in a manner intended to permit the examination of the effects on imagery and verbal recall when text is approached at different levels of processing (Craik & Lockhart, 1972). Levels of processing in reading has become generally understood to mean that deeper levels involve more meaningful, semantic analysis, as opposed to more surface level, graphemic processing. Because imagery variables have been related to deeper processing in reading, such as recognition of a story's theme, we adopted this view in the present research. This study, however, represents a major departure from the bulk of levels of processing studies, which have employed relatively low level, artificial materials and laboratory tasks such as finding and circling target letters in a list of words versus evaluating how well one likes the referent of the words. The present study reflects more realistic encounters with reading through the use of a literary text in a classroom setting, emphasizing ecological validity.

In summary, the study addresses the following questions:

1. Can imagery reports be reliably categorized? If so, are categories of verbal recall and reported imagery highly correlated or can they be seen as indicators of somewhat independent systems, as suggested by previous research and theory?
2. Are verbal recall and reported imagery retained in a similar or different manner over a 48 hour period?
3. Are imagery reports related to story macrostructure as defined by story grammar theory and/or to salient parts of a story, such as the climax?
4. To what extent do instructions to read at different levels of processing affect verbal recall and imagery reports?

METHOD

Subjects

Five intact classes of students in a community college in Texas served as subjects. The mean age of the students was 20.7 years; 53% were male, 47% female. Students who did not score above the 20th percentile on the *Stanford Diagnostic Reading Test* (Karlsen, Madden, & Gardner, 1977) were eliminated from the sample. The final sample size was 72.

Materials

All students read one story, "First Kill," which is an excerpt from a novel for young adults (Annixter & Annixter, 1958). The story, approximately 2,100 words (35 paragraphs) in length, is a typical adolescent adventure story that has been used in much reading research as one of the stories in the *Reading Miscue Inventory* (Goodman & Burke, 1972). The story concerns the coming of age of a Sioux Indian youth who determines to become a tribal hunter. Under the mentorship of a tribal elder, he forges weapons and decides to join an upcoming buffalo hunt. He is at first mocked by the other hunters, according to Sioux custom, but persists and rides his horse into the stampeding buffalo herd. He selects his prey, but cannot fell it with two arrows. Pursuing the buffalo with determination, he desperately leaps onto its back and kills it by cutting its throat with his hunting knife. He skins his prey and is later accompanied by the other hunters on a triumphal return to camp, where there is ceremony and feasting in honor of his new status. The story has many exciting, imageable passages, and is conventionally plotted with distinct rising action, climax, and falling action. The story's episode structure (story grammar) is readily identifiable. The readability of the story is in the high seventh-grade range on the Fry readability graph (Fry, 1977). Since the mean grade-equivalent score on the standardized test given the final sample of students was beyond 12.9, the story could be considered comfortable reading for virtually all of the students. Some description of Sioux customs using Sioux terms may have made one or two passages vague for those with little historical background of this culture. The story was presented double-spaced typed with no illustrations.

Design and Procedure

Three task conditions not uncommon to schooling were devised in an attempt to experimentally control the level of processing of the story. One task condition instructed students to read the story for its theme, or the authors' underlying message. A brief explanation and example of a theme were provided. A second task condition instructed students to read the story as they would normally read for pleasure. A third task condition instructed students to read the story and circle any typographical errors in the text that they noticed. The text for this group was

modified to include from one to eight typos per paragraph (78 total), with five short paragraphs having no typos at all. The typos were intentionally obvious (e.g., "carevully," "bufaflo") and spelling deviations did not result in other known words. All groups were asked to read the story once silently and not to go back. Students were unaware of the specific tasks to follow reading.

It was anticipated that instructions to search for the theme or underlying message of the story would prove most likely to evoke deeper processing of text content and meaning. Instructions to search for typos were intended to elicit shallower processing by regularly cueing judgments about the correctness of word forms. This task resembled proofreading and provided an ecologically valid manipulation of processing levels. As Tinker (1965) pointed out: "The successful proofreader must constantly ward off the tendency to become absorbed in the meaning of the text. Crosland (1924) discovered that proofreaders miss many errors when they attend too much to meaning" (p. 24). Proofreading is a more realistic task than many of the artificial tasks used in previous levels of processing research and therefore served as a more valid way to manipulate processing depth away from meaning. The instructions to read for pleasure were intended to be neutral with respect to processing depth, but it was anticipated that readers left to their own devices would more closely resemble the processing of the theme group than the typo group.

After reading, students recalled the passage and reported their images of the story. Order of the recall and imagery tasks was counterbalanced. In the recall task, students were asked to provide full and accurate written recalls of the story in their own words. In the imagery task, students were asked to number and briefly describe in writing each mental image that they remembered from reading the story. Randomization procedures were used to assign students to processing instruction groups and to counterbalance the imagery reporting and recall tasks.

Forty-eight hours later, students were again asked to provide written free recalls and written and enumerated imagery reports. The counterbalancing order used in the first session's tasks was retained. During the second session, students first took the reading comprehension subtest of the community college level of the *Stanford Diagnostic Reading Test*. In both sessions, all tasks were carried out during regularly scheduled class times in regular classrooms.

Coding of Recall and Imagery Reports

The coding of students' recalls and imagery reports entailed an extensive system of qualitative categories. The coding of recall variables followed procedures established in the text comprehension and memory literature. For imagery reports a new coding system was devised. Two hundred and eighty-eight protocols were analyzed.

Recall. Recall statements were first categorized as either: (a) directly related to a single T-unit of the text (an independent clause with all its dependent clauses;

Hunt, 1965), (b) a synthesis of information from more than one T-unit, (c) an importation that was consistent with the story, or (d) an importation that was inconsistent with the story. Proportion of interrater agreement on a randomly selected 10% of the protocols was .96 for these categorizations. If a recall statement could be directly related to a T-unit, it was further categorized either as capturing the gist of the T-unit with no more than minor distortions or omissions, or as being somewhat related to the T-unit but having major distortions or omissions. Interrater agreement was .95 on these categorizations. Finally, if a recall statement was categorized as a synthesis of information from more than one T-unit, the various T-units that comprised the synthesis were identified and enumerated. Interrater agreement here was .89.

Imagery. Imagery reports were more general than recall reports, and could seldom be related to a specific T-unit. They were therefore analyzed in terms of their relationship to paragraph level text units. Images were categorized as: (a) directly related to a text paragraph, (b) a synthesis of information from more than one paragraph, (c) an importation that was consistent with the story, or (d) an importation that was inconsistent with the story. Interrater proportion of agreement was .84 for these categorizations. If an imagery report was directly related to a paragraph, it was further categorized as very consistent with the language of the text, elaborated beyond but consistent with the text, or elaborated beyond but involving a major distortion or contradiction of the text. Interrater agreement was .84 for these categorizations. If an imagery report was categorized as a synthesis of information from more than one paragraph, the various paragraphs represented in the synthesis were identified and enumerated. Interrater agreement here was .95. Finally, all imagery reports were also categorized by sensory modality: visual, auditory, olfactory, gustatory, kinesthetic, tactile (including physical feelings, e.g., discomfort), affective (emotional imagery), nondeterminate, or multiple modality. A conservative standard for categorizing modalities was adopted. For a modality to be assigned, the students' imagery reports had to clearly indicate a modality by use of language such as "I could see . . . ," "I could hear . . . ," or by inclusion of modality specific information not present in the text (e.g., descriptions of facial expressions not described in the story were coded as visual). Where no language that revealed modality was present, the reported image was rated as nondeterminate in modality. Interrater proportion of agreement was .84 for these categorizations. Because this categorization system is new and unique in the literature, Figure 1 exhibits selected relevant examples of imagery reports with associated text segments and categorical ratings.

RESULTS

The percentage of all recall statements and of all imagery reports, summed across subjects, that fall in each of the coding categories described in the previous

Text	Student Protocol and Rating
"Though he had not known for sure that he would be using them soon, Hawk had been making arrows for the past two moons. Not the small, blunt arrows which boys used to shoot at birds and squirrels, but flint-headed arrows, ground sharp as knives."	"I can see Hawk making arrow points." [Consistent with paragraph; visual modality] "Picture of a boy sitting alone making arrows for his bow dreaming of the day when he can use them." [Elaborated beyond, but consistent with paragraph; visual modality]
"The feathered shaft sank half its length behind the shoulder. . . . He let go a second shaft inches below the first. The young buffalo bellowed, yet pounded on. . . ."	"Hawk was upset when he shot his first arrow and missed the buffalo's heart." [Elaborated beyond, but consistent with paragraph; affective modality] "He shot with frustration and excitement." [Elaborated beyond, but consistent with paragraph; affective modality] "When Hawk shot the buffalo I could imagine the arrow going into the animal." [Consistent with paragraph; nondeterminate modality]
"Scalding shame poured through Hawk. He was not strong enough to bring down game, even with a man-sized bow and perfect arrows! . . . This animal would suffer much, for it would be hours or days before he would die. * * * . . . His buffalo mount was crashing now through low brush and Hawk's legs and sides were cut with whipping branches till the blood ran. . . . The animal's blood spurted, covering Hawk's arm."	"Image of the boy's discouragement on his face after he realizes he doesn't have the strength to shoot an arrow that provides a fatal blow to a buffalo." [Elaborated beyond, but consistent with paragraph; visual modality] "I could see the blood on his arm and feel how the buffalo was running wildly. I was running through the brush with him." [Synthesis image that unites information from more than one paragraph; multiple modalities: visual and kinesthetic] "Hawk in pain after shooting the buffalo. I picture him filled with frustration trying to kill the animal. The scene is bloody and sickening to a boy his age." [Synthesis; affective modality]
"Darkness had almost fallen when Hawk rode into camp. . . . the story of his triumph had gone before him . . . so that there was awe in the eyes of his playmates . . . . * * * Standing Elk came and took hold of Hawk's thong bridle, calling out as was the custom. 'Look, my son has become a hunter! My son is brave.' * * * That night there was feasting in the Sioux camp. . . . Hawk was asked and re-asked to tell the story of his hunt."	"Hawk riding back into camp and the proudness of his father." [Synthesis image; affective modality] "Hawk's father's face beaming with pride and approval for his son had done a courageous thing." [Synthesis; visual modality] "I could see and feel his excitement when he was being honored in the camp." [Synthesis image; multiple modality: visual and affective]
No text with which to relate.	"The boy was small, about fourteen, dark skinned, had a feather in his hair and clothing of beads and bearskin. [Story-consistent importation; visual modality] "I also saw the future of the boy telling his tale to his playmates, then his son, and maybe his grandson." [Story-consistent importation; visual modality] "Truthfully, scenes from Man From Snowy River come to mind most often. As younger boy's determination to prove he's a man." [Story-consistent importation; nondeterminate modality]

*Note: * * * indicates that one or more paragraphs were skipped.*

Figure 1. Text segments, protocols, and categorical ratings of selected imagery reports.

Table 1

Percentages of Total Recall and Imagery Variables in Immediate and Delayed Conditions Reported by Total Sample, N = 72

Variable	Immediate	Delayed
Recall		
T-unit gist or minor distortion/omission[a]	65.56	68.11
Major distortion/omission[b]	5.63	5.89
Synthesis of information from two or more T-units	6.88	6.19
Included as a component of a synthesis	15.86	14.01
Story consistent importation[a]	4.00	3.22
Story inconsistent importation[b]	2.07	2.58
Imagery		
Image very consistent with language in paragraph	17.55	23.29
Elaborated beyond but consistent with paragraph	16.47	11.59
Distortion/contradiction of language in paragraph[c]	1.19	1.66
Synthesis of information from two or more paragraphs	14.74	14.73
Included as a component of a synthesis	42.90	42.94
Story consistent importation	7.04	5.57
Story inconsistent importation[c]	0.11	0.22
Imagery Modality		
Visual imagery	22.97	15.45
Auditory imagery[c]	0.11	0.22
Kinesthetic imagery[c]	0.00	0.11
Olfactory imagery[c]	0.54	0.11
Tactile imagery[c]	0.65	0.22
Gustatory imagery[c]	0.00	0.00
Affective imagery	15.60	11.37
Nondeterminate (no modality specified)[c]	57.10	70.64
Multiple (more than one modality specified)[c]	3.03	1.88

[a]These variables were merged in subsequent analysis. [b]These variables were merged in subsequent analysis. [c]Eliminated in subsequent analysis.

section is presented in Table 1. Note that each imagery report was coded twice: once by relationship to the text (paralleling the coding of recall), and once by modality. Due to low frequencies (approximately 5% or less) for the recall categories of story consistent and story inconsistent importations, these variables were merged with conceptually related variables for further analysis. Story consistent importations were merged with recalls which captured the gist of the T-unit with only minor distortions or omissions; story inconsistent importations were merged with recalls which indicated a major distortion or omission. In this way, recall of the gist of the text was combined with reader-based importations that were consistent with the story, and recalls that distorted or omitted text information were combined with

reader-based importations that were inconsistent with or violated the story. The resulting categories reflect basically accurate versus basically inaccurate recall. Imagery variables that accounted for less than 5% of total reported imagery were deleted from further analysis because they had insufficient variance to provide a reasonable test of relationships between variables (i.e., floor effects). Imagery of nondeterminate modality was also deleted because results of analysis using this variable would be uninterpretable as to modality. Descriptive statistics for variables retained for further analysis are given in Table 2.

Relationships Between Imagery and Other Variables

Imagery and recall. Immediate and delayed imagery and recall variables were computed for each subject (Table 2). Correlations were computed for the entire sample as no overall significant difference was found between the three task groups for these variables. Table 3 exhibits these correlations.

The correlation matrix is characterized by many low to moderate correlations. With only one exception, high correlations (.70+) appear between totals and their

Table 2

Means and Standard Deviations for Total Sample for Immediate and Delayed Time Intervals

Variable	Immediate		Delayed	
	M	*SD*	*M*	*SD*
Recall				
Gist/story-consistent importations	28.81	15.39	22.92	12.33
Distortion/story-inconsistent importations	3.15	2.99	2.74	2.26
Synthesis recalls	2.83	1.96	2.00	1.41
Components in synthesis recalls	6.50	4.48	4.53	3.39
Total recall*	35.31	14.28	26.54	12.89
Imagery				
Consistent with paragraph	2.25	3.01	2.93	3.92
Elaborated beyond paragraph	2.11	2.32	1.46	1.91
Synthesis images	1.88	1.68	1.86	1.52
Components in synthesis images	5.50	4.90	5.42	4.81
Story-consistent importations	0.90	1.41	0.71	1.33
Visual modality	2.94	3.32	1.94	3.17
Affective modality	2.00	3.52	1.43	2.71
Total imagery**	7.32	4.86	7.14	5.44

*Total recall = Gist/story-consistent importations plus components in synthesis recalls (i.e., all recall consistent with the story). **Total imagery = The number of images enumerated by the reader minus the number of distortions/contradictions of language in the paragraph and story-inconsistent importations (i.e., all images consistent with the story).

Table 3

*Correlations Between Recall and Imagery Variables**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Immediate recall																										
1 Gist/Story consistent importations	1 00	07	− 23	− 26	23	25	18	16	01	33	− 04	64	− 20	− 11	− 14	21	06	20	22	− 05	05	03	95	32	58	20
2 Distortion/Story inconsistent importations		1 00	− 03	− 03	− 08	30	− 08	− 09	− 04	− 00	− 01	19	44	02	04	01	18	23	30	01	04	15	01	06	17	14
3 Synthesis			1 00	98	− 02	− 08	07	14	02	− 19	29	− 06	10	51	48	− 14	− 07	04	06	02	− 04	00	06	− 03	05	− 12
4 Components in synthesis				1 00	− 03	− 08	08	13	02	− 21	25	− 08	10	47	47	− 17	− 09	04	06	02	00	− 03	03	− 03	03	− 15
Immediate imagery																										
5 Consistent with paragraph					1 00	11	22	10	− 12	04	− 09	36	− 18	02	00	67	05	19	14	03	− 07	− 07	23	73	36	57
6 Elaborated beyond paragraph						1 00	22	20	− 04	45	20	17	− 12	− 06	− 08	35	38	23	30	− 05	25	08	19	62	13	45
7 Synthesis							1 00	92	− 14	29	27	17	− 21	− 02	− 05	33	17	31	25	− 04	09	− 01	21	57	15	38
8 Components in synthesis								1 00	− 14	29	27	16	20	00	− 05	33	17	31	25	− 04	09	− 01	20	45	15	34
9 Story-consistent importations									1 00	05	13	03	13	02	02	02	− 04	− 09	− 07	68	02	− 06	02	13	04	11
10 Visual modality										1 00	− 06	16	− 12	− 11	− 17	09	22	− 06	04	23	40	01	25	36	11	19
11 Affective modality											1 00	− 01	− 08	27	23	08	14	30	28	02	− 06	34	03	17	06	18
Delayed recall																										
12 Gist/Story consistent importations												1 00	02	08	05	36	07	40	37	− 04	09	− 03	64	36	96	38
13 Distortion/Story inconsistent importations													1 00	− 09	− 06	− 17	20	03	07	13	− 05	12	− 20	− 20	− 02	01
14 Synthesis														1 00	96	− 06	− 07	− 01	00	− 04	− 16	11	03	− 03	33	− 09
15 Components in synthesis															1 00	− 10	− 14	− 02	00	− 07	− 18	08	00	− 07	31	− 15
Delayed imagery																										
16 Consistent with paragraph																1 00	09	37	28	− 04	− 06	− 06	14	70	32	87
17 Elaborated beyond paragraph																	1 00	07	12	00	17	42	00	26	01	46
18 Synthesis																		1 00	93	− 16	01	23	18	33	36	51
19 Components in synthesis																			1 00	− 08	09	34	20	31	34	47
20 Story-consistent importations																				1 00	22	− 04	− 05	17	− 06	17
21 Visual modality																					1 00	− 03	04	10	03	08
22 Affective modality																						1 00	00	− 03	− 02	16
Totals																										
23 Immediate recall																							1 00	30	61	13
24 Immediate imagery																								1 00	33	74
25 Delayed recall																									1 00	31
26 Delayed imagery																										1 00

*Significance levels at $N = 72$ ($df = 70$) $r = \pm .23$, $p < .05$, $r = \pm .30$ $p < .01$

largest components, or between synthesis statements and their number of components (logically dependent correlations). The exception is a .70 correlation between the immediate imagery total and delayed imagery consistent with the text. Many of the higher moderate correlations are found between a variable in the immediate condition and its counterpart in the delayed condition. Immediate recall variables did not correlate highly with immediate imagery variables, and delayed recall variables did not correlate highly with delayed imagery variables, with only a few of these correlations reaching statistical significance.

A similar pattern is evident across the retention interval. The correlation between total immediate imagery and total immediate recall was $r = .30$, $p < .01$. The magnitude of this relationship remained quite stable across the 48 hour retention interval, as total delayed imagery and total delayed recall correlated at $r = .31$, $p < .01$. Correlation of total imagery over the retention interval was much higher, with total immediate imagery and total delayed imagery correlating at $r = .74$, $p < .0001$. Correlation of total recall over the retention interval was also considerably higher, with total immediate recall and total delayed recall correlating at $r = .61$, $p < .0001$. These bivariate results suggest two largely separate systems.

For purposes of data reduction and structural parsimony, all the logically independent immediate imagery and recall variables were factor analyzed. Totals for recall and imagery reports were deleted because the totals were combinations of other variables (see Table 2). Components in synthesis for recall and imagery were also logically dependent on their respective synthesis statements, and were therefore deleted. The remaining immediate recall and immediate imagery data matrix as defined in Table 3 was subjected to a principal components analysis. Using the 1.0 eigenvalue criterion, four factors were retained, and rotated to an orthogonal (varimax) solution that best approached simple structure for this data set.

The factor structure and related variance and communality statistics are exhibited in Table 4. The four factors account for 65% of the total variance in the model with the first three factors receiving their highest loadings from visual imagery, affective imagery, and story-consistent imagery importations, respectively. Verbal variables loaded moderately on these factors, suggesting an integration of verbal and imaginal processes, but the experience of reading and recalling this story may be seen as having been primarily an imaginal one. Specific discussion of these factors follows in the Discussion section.

Imagery and story structure. For purposes of relating imagery to the story's structure, the text of the story was analyzed according to Mandler and Johnson's (1977) story grammar rules. This resulted in the identification of eight story units including: a setting, five complete episodes, each with a beginning, development, and ending; and two sub-episodes, the first of which introduced, and the second of which concluded, a brief subplot. T-units which were seen as macrostructural were identified in keeping with Mandler's (1984) contention that story sentences or

Table 4

Factor Analysis of Immediate Recall and Imagery Variables

	Factor Loadings				
Variables	I	II	III	IV	h^2
Recall					
Gist/consistent importations	.67	−.17	−.13	−.02	.50
Distortion/Inconsistent importations	.01	−.05	.01	.89	.79
Synthesis Recalls	−.38	.66	−.04	−.02	.58
Imagery					
Consistent with paragraph	.25	−.02	−.64	−.25	.53
Elaborated beyond paragraph	.62	.24	−.06	.53	.73
Synthesis images	.45	.52	−.40	−.19	.66
Story consistent importations	.17	.08	.80	−.24	.73
Visual imagery	.80	−.02	.07	.02	.64
Affective imagery	.05	.82	.17	.06	.71
Proportion of variance	.23	.16	.14	.12	
Cumulative proportion		.39	.53	.65	

clauses are hierarchically important to the extent that they express settings, goals, attempts, and outcomes rather than elaborating that content or providing preconditions that must be fulfilled to arrive at the main function of the story grammar unit.

Because imagery reports could only be reliably associated with paragraphs rather than T-units in this study, total immediate imagery reports per paragraph were correlated with the number of macrostructural T-units found in the respective paragraph. The correlation was $r = .63$, $p < .001$. However, because paragraph length varied considerably, the correlation was partialed by paragraph length in words. The resulting partial correlation, controlling for paragraph length, was $r = .45$, $p < .004$.

Previous research with this story (Sadoski & Goetz, 1985) and other stories (Sadoski, 1983, 1985; Sadoski, Goetz, & Kangiser, 1988) suggests that imagery reports are not evenly distributed throughout stories but tend to cluster at key climactic points, points which are not specifically defined by story grammar rules (Black & Wilensky, 1979). A similar clustering occurred for all three task groups in this study. One paragraph dominated the immediate imagery reports with 71 total reported images, well above the average reported images for a paragraph ($M = 20.7$, $SD = 16.9$), and well above the number reported for the next highest paragraph (51 images). This paragraph is identifiably the high point of the story's action and suspense, that is, its climax: the Indian youth's desperate ride on the buffalo's back when he delivers the death wound.

Effects of Experimental Conditions

A multivariate analysis of variance (MANOVA) was performed on the recall and imagery variables presented in Table 2 using a $3 \times 2 \times 2$ design with two between-subjects factors (theme-, pleasure-, or typo-processing instructions, and order of recall and imagery reporting), and one repeated measures factor (immediate vs. 48 hour retention intervals). No significant main effects for processing instructions or order were found. A significant main effect for retention interval was found, $F(13, 54) = 3.40$, $p < .0008$. No significant interactions were found.

Univariate $3 \times 2 \times 2$ ANOVAs revealed significant differences over retention interval for recall of gist/story-consistent importations, $F(1, 66) = 17.91$, $p < .0001$; synthesis recalls, $F(1, 66) = 15.45$, $p < .0002$; number of components in synthesis recalls, $F(1, 66) = 15.30$, $p < .0002$; and total recall, $F(1, 66) = 27.39$, $p < .0001$. In each case, immediate recall exceeded delayed recall. For imagery, significant differences were found for imagery elaborated beyond the paragraph, $F(1, 66) = 4.85$, $p < .031$; and visual imagery, $F(1, 66) = 7.33$, $p < .008$. Both means were higher for the immediate interval. Total imagery was not significantly lower after the delay, as was the case with total recall.

DISCUSSION

This study examined, in a realistic context, the relationships between verbal recall and spontaneously occurring imagery in reading a complete literary text. A reliable system for qualitatively categorizing imagery reports was developed. Aspects of the study addressed relationships between imagery categories and verbal categories in both immediate and 48-hour delayed conditions, relationships between imagery and story structure, and the effects of different processing instructions on recall and imagery.

Categories of recall were taken from the text comprehension and memory literature, and a comparable set of imagery categories was derived that completely accounted for the present data. Interrater reliabilities were .84 or above for all coding decisions.

Bivariate correlation analyses revealed no high correlations and few moderate correlations between verbal recall and imagery reports, suggesting separate systems. A factor analysis performed on the immediate data matrix indicated that three of the four significant factors received their highest loadings from imagery variables. Factor I received a high loading from imagery reported as visual in modality. It also received moderately high loadings from imagery elaborated beyond the paragraph, and from the gist/story-consistent importation recall variable (a measure of accurate, story-consistent, but not verbatim, recall). This factor may be interpreted to indicate that the immediate recollection of the reading of this story was

characterized by the experience of text-based, reader-elaborated memories primarily in the form of visual images, and somewhat secondarily as verbal recall of text material. Two other low-moderate loadings might suggest a processing distinction involving synthesis: a positive loading for synthesis images and a negative loading for synthesis verbal recalls. The more visualization, imagery elaboration, and recall of verbal gist that occurred, the more information was pulled together and reported as imagery, but the less information was pulled together and reported as verbal recall. A qualitative distinction may exist distinguishing the "chunking" of imaginal and verbal memories.

Factor II received its highest loading from affective (emotional) imagery. It also received moderate loadings from synthesis recall and synthesis imagery. This factor can be interpreted as readers investing synthesized recollections with empathy or other emotional response, also primarily in imaginal form.

Factor III received a high loading from reader-imported imagery from outside the text that was consistent with the story and did not distort or contradict it. Moderate negative loadings from imagery consistent with the text and synthesis images (composed of text-related information) indicates that imagery importations operated somewhat inversely with text-related imagery.

Factor IV received a high loading from the distortion/story-inconsistent (inaccurate) recall variable, and a moderate loading from imagery elaborated beyond the text. This relationship is more difficult to interpret, but may suggest another processing distinction: Processing spent in elaborating imagery takes a toll on accurate verbal recall, and vice-versa. Other factor-analytic studies have found that verbal recall and imagery report variables load together on a series of factors with verbal recall dominating some factors and imagery dominating other factors (Sadoski, 1983). These findings have been replicated (Sadoski, 1985). The replicability of the factors identified in this study warrants further research.

Imagery and verbal recall variables behaved differently over time. Total recall and every recall variable except distortion/story-inconsistent importation were significantly lower after 48 hours. In contrast, total imagery was not significantly lower after the delay. Only imagery elaborated beyond the text and imagery reported as visual in modality were significantly lower after 48 hours. These findings are very consistent with much research indicating that imagery is robust in memory (Paivio, 1971, 1986).

Imagery reports were found to be moderately correlated with story macrostructure. The more information concerning settings, goals, attempts, and outcomes that was included in a paragraph, the more imagery reports tended to be associated with that paragraph. Also, the paragraph that garnered the most imagery reports was at the story's climax. This finding is markedly consistent with other findings with this and other stories (Sadoski, 1983, 1985; Sadoski & Goetz, 1985; Sadoski, Goetz, & Kangiser, 1988).

An experimental attempt to control level of processing in the story by instruct-

ing students to find a thematic message in the story, to read normally for pleasure, or to locate typos included in the text, produced no overall significant main effect or interaction over time. Most previous research demonstrating levels of processing in reading has used artificial materials and laboratory tasks. The present results suggest that the large effects produced by manipulating levels of processing may not be found when examining more realistic encounters with test. When using a reasonably engrossing literary text, even instructions to search for spelling typos may not prevent students from experiencing the story. For interesting texts, there may be no ecologically valid way to manipulate processing depth through task instructions. The original levels of processing model also may have been an oversimplification. Craik (1979, p. 448) has stated that "Craik and Lockhart's (1972) suggestion of a fixed, linear series of analytic levels, with processing that could be 'stopped' at various stages, is just not tenable in view of recent work showing recursive operations operating both in a top-down and bottom-up fashion."

A summary description of the comprehension and recall of this story can be suggested. Regardless of processing instructions and text manipulation, readers appear to have been absorbed in an imaginative, "lived through" experience. They formed powerful visual and affective images that were generally consistent with the text, and elaborated and synthesized portions of it, but also constructed images involving importations from other experiences. Their images tended to be somewhat related to the structure of the story, particularly the climax. Non-imaginal, verbal comprehension in sentence gist form, in larger synthesized chunks, and in the form of importations, occurred in a manner quantitatively different from and only partially integrated with imagery. In fact, imagery elaborations were somewhat correlated with verbal distortions in recalling the story, suggesting a possible trade-off between processes. That is, imaginal elaboration may be powerful enough to override verbal, literal elements of the text; conversely, excessive attention to verbal, literal elements of the text may reduce imaginal elaboration—a point teachers may wish to consider. This effect, however, does not appear to be large. At any rate, images of the story were much more prevalent in memory two days later than verbal recall, further suggesting a distinction in processes and the power of imagery in reading a story. Educators may wish to consider the application of imagery as a vehicle for the long-term recall of stories, for example, in the comparison of thematically related literary works.

Overall, this study has demonstrated, with one story, that imagery and verbal processes can be seen as basically separate processes that operate in a complex, integrated fashion in reading. Although a single text was intensively analyzed here, the results corroborate findings of related research. The present study contributes incrementally to a small but growing line of research, using various texts and methodologies, indicating that researchers and theorists interested in the cognitive aspects of reading must seriously address imaginative responses to reading in the future.

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