Figure 5.1. Sample one-experiment paper. The circled numbers refer to numbered sections in the Publication Manual.

Individual Differences in Bimodal Processing and Text Recall
Bruce R. Dunn and Kate L. Rush
University of West Florida

Abstract, 5.16
The differences in semantic recall among students with either an analytic or a holistic cognitive style were investigated. The cognitive style was determined by the amount of bilateral alpha activity (8–13 Hz) measured from the cerebral cortex of the brain during 2 eyes-open baseline recordings. The results indicated that the analytic group (who produced less bilateral alpha activity than did the holistic group) recalled more of the logically or semantically important information from structured expository text than did the holistic group. Holistic individuals recalled more of the semantically important information from high-imagery poetry than did analytic individuals. The findings are congruent with the bimodal theory of conscious processing and support the position that individual differences are important factors in memory research.

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Individual Differences in Bimodal Processing and Text Recall

A growing body of research has indicated that variations in the electrical activity from the brain, as recorded by an electroencephalograph (EEG), particularly the amount of alpha activity, can be used to identify a person's manner of processing information, that is, a person's cognitive style (e.g., Davidson & Schwartz, 1977; Doktor & Bloom, 1977; Ornstein & Galin, 1976). Much of this research is influenced by what has been termed the bimodal theory of cognitive processing (Deikman, 1971, 1976; Dunn, in press; Ornstein, 1973, 1977). Bimodal theory contends that the mode or type of conscious processing (i.e., analytic or holistic) influences the form the information is stored in memory. In the analytic logical and sequential processing style, the right cerebral hemisphere is more active, whereas the left cerebral hemisphere is more active in the holistic processing style. Dunn (in press; Dunn, Gould, & Singer, 1981) has argued that cognitive-style differences occur because individuals weight these two modes differently when processing stimuli. Research (e.g., Dunn et al., 1981) has indicated that processing style can be determined by the amount of alpha activity (8-13 Hz) measured from the cerebral cortex of the brain. People whose occupations require great analytical skill produce less alpha activity than those whose occupations do not require such analytical skill (Doktor & Bloom, 1977; Ornstein & Galin, 1976). Furthermore, those persons described as analytic, so described because they produce lower levels of alpha activity than those described as holistic, recall lists of words and highly structured text in a more categorical or logical order than do their holistic counterparts (Dunn et al., 1981; Hymes, Dunn, Gould, & Harris, 1977).

There is one major caveat to these theoretical views. Although some researchers (e.g., Doktor & Bloom, 1977) have recorded EEG activity while participants performed tasks that required either analytic or holistic skills, few, if any, researchers have reported the actual performance on both types of tasks. The few investigators who have attempted to relate individual differences in alpha activity to differential performance (Dunn et al., 1981; Hymes et al., 1977) have used logical or analytical.
verbal materials and tasks; no researcher has reported performance on a holistic task. Thus, research to this time has measured only quantitative differences in analytical processing and has not identified the two qualitatively distinct styles implied by the terms analytic and holistic.

In this study we attempted to identify the qualitative differences between styles by having participants recall a high-imagery poetry passage with little logical or analytical content. It was assumed that encoding and recalling material consisting of images would require more holistic processing than would encoding highly logical, expository text. Our belief is supported by experts on the structure of metaphor, or an irreducible, tightly structured example of a hypothetical logical high-imagery prose; that persons should readily than expository the opposite pattern. If it is assumed that numbers should be used to test these patterns.

Participants
Sixty upper division university students (30 women and 30 men, mean age = 21.6 years) volunteered to participate. All participants were strongly right-handed, as determined by the Laterality Assessment Inventory (Sherman & Kolhavy, 1976). Volunteers were paid for their participation and were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992).

Materials
Two passages with approximately the same number of words were used. The first passage, "Chemical Pesticides," was a 155-word expository passage developed by Howell (1980) and based on the work of Meyer and Freyde (1979). We chose this particular passage because the highest level of its semantic structure was defined by a logical cause-and-effect relation. All items directly related to this level were considered to be the most important points of the passage, and all items indirectly related were considered to be less important (see Howell, 1980; Meyer, 1975). The second passage was a 151-word poem, by Richard Eberhart titled "Seals, Tunes, Time" (cited in Brown & Milstead, 1968). We chose the poem after consulting with three poetry specialists, who agreed that the poem was
Individual Differences

highly figurative and nonanalytical. 

Footnotes, 3.87, 5.20

Design and Procedure

Testing occurred in two sessions 1 week apart. In each
session, 3-min, eyes-open EEG recordings were made for each
participant. We used these recordings as baseline recordings
to determine cognitive style (see the Results section).

Grass 7PS-J preamps and a PDP 11/34A computing system
were used. Before each participant was measured, the
complete recording system was checked by sending a 50-μV,
10-Hz signal from the electrode leads through the outputs
of the computer's analog-to-digital converter. A specially
written Fourier analysis program, independently tested by
others (e.g., G. S. Wolverton, personal communication, 
February 21, 1983), was used.

Conventional frequency
waves were made from two pairs of
channels on the left hemisphere
(right hemisphere. They appear to be highly
(normal, 1972).

During the first
was recorded. During
were recorded, and the
for 5 min. In this

Scientific
abbreviations, 3.25
numbers, 3.42

was recorded, the two passages, Passages were
counterbalanced across participants, and each passage
appeared, a paragraph at a time, on the computer monitor,
which was placed at eye level 1 m in front of the
participant. Participants initiated the reading-recall
sequence for each passage by pressing the space bar on the
terminal to present each paragraph. Participants read at
t heir normal rates, and after they finished reading they
wrote down as much of the passage as they could remember,
taking as much time as necessary. They were also instructed
to press the key that recorded the time interval between
bar presses for both reading and recall tasks. Participants
had a rest period of 3 min between the two reading-recall
sequences. At the end of the session, the purpose of the
study was explained to each participant.

Scoring

Recall data. Because the high-imagery poetry was
nonanalytical and nonsequential, none of the existing prose
analysis procedures (e.g., Kintsch, 1974; Meyer, 1975)
could easily be used to determine semantic content of the
poem. Instead, three graduate students proficient in English
independently ranked sentences in the passage from most
important to least important. Other researchers (e.g.,
Meyer & McConkie, 1973) successfully used this method to
determine the mix of narrative and expository text.
The expository "Chemical Pesticides" passage was analyzed in an identical manner, even though established analysis procedures like Meyer's (1975) could have been used to make the resultant semantic hierarchies as equal as possible. Two independent raters judged participants' recall protocols and then determined which recalled sentences were contained in the formerly described semantic hierarchies. The scoring method was determined, and paraphrased versions of the sentences were scored as well. The reliability of the ratings was acceptable (93%) by a reverse-scoring procedure. Because the resultant hierarchies had unequal levels of subordinated information, and the last 15 sentences of each hierarchy were used.

EEG data. Each second of EEG data was deleted. Fourier transforms were used to transform the remaining EEG data into power scores, which were taken as a measure of the power of the signal. The Pearson product-moment correlation coefficient was used to measure the strength of the linear relationship between two variables. The correlation coefficient ranges from -1 to +1, where -1 indicates a perfect negative correlation, 0 indicates no correlation, and +1 indicates a perfect positive correlation.

Recall Data

The proportional recall data were analyzed with a 2 x 2 x 2 (Type of Processor x Passage x Level of Subordination) mixed analysis of covariance, with average reading time serving as the covariate and with passage and level serving as repeated measures. Although several main effects and two-way interactions reached statistical significance, they were of little interest because a significant three-way (Type of Processor x Passage x Level of Subordination) interaction was obtained, F(1, 58) = 29.93, p < .01. For ease of interpretation, Figure 1 shows this interaction as a two-way (Passage x Level of Subordination) interaction, one for each processing style. The three-way interaction indicates that analytic processing is more effective than holistic processing when the passage is presented at a higher level of subordination.

Figure 5.1. (continued)
Individual Differences

Persons recalled proportionally more superordinate information from the logically structured expository text than from the high-imagery poetry. In contrast, the holistic group recalled more of the important information from the poem than from the expository passage. Simple-effects tests of the interaction showed that the analytic group's mean recall of important information from the expository text (.70) was greater than the holistic group's mean recall (.52). Furthermore, the holistic group recalled more important information from the poem than the analytic group did (.72 vs. .58).


def data

Recall data indicate that the holistic group's mean recall of important information from the poem (.72) was greater than the analytic group's mean recall (.52). Furthermore, the holistic group recalled more important information from the poem than the analytic group did (.72 vs. .58).
These recall results cannot be discounted by either reading time or total proportional recall differences. The mean for proportional recall, for example, was approximately the same for the analytic and the holistic groups (expository passage, .66 vs. .78, respectively; poetry passage, .59 vs. .60, respectively). Because both groups recalled more superordinate information than subordinate information, the results seem to demonstrate a quantitative rather than a qualitative difference in analytical reading. The differential recall of superordinate information was the poem by the two groups' performance. As et al. (1981), holists showed more alpha activity than did analysts; call tasks. Furthermore, more alpha activity while reading than while reading activity showed the opposite qualitatively distinct activity. Admittedly, the potential structure across the present study is not very straightforward, but it is clear that there are some apparent differences across the superordinate dimension. 

Variables and by varying visuospatial tasks in order to determine their effects on the recall and perceptual performance of analytic and holistic individuals. Also, other promising individual-difference constructs, such as extraversion (H. J. Eysenck, 1967; M. W. Eysenck, 1976, 1977) and field dependency (Witkin, Dyk, Paterson, Goodenough, & Karp, 1962), should be compared with the analytic-holistic dimension in terms of success in predicting differential recall. The results have a more indirect implication, which is reflected in the following statement by M. W. Eysenck (1976):

In spite of the obvious importance of individual differences in human learning and memory, relatively few investigators incorporate any measure of intelligence, personality, or motivation into their studies. Instead, they prefer to relegate individual differences to the error term in their analyses of variance. (p. 7)

Given the robustness of these results and the results of others (for reviews, see M. W. Eysenck, 1977, and Goodenough, 1976), it may behoove memory researchers to pay closer attention to individual differences.
References, 5.19

of psychologists and code of conduct. American psychologist, 47, 1597-1611.


Figure 5.1. (continued)

Florida State University, 1989). Dissertation Abstracts International, 42, 1011B.


Author Note

Bruce R. Dunn and Kate I. Rush, Department of Psychology, University of West Florida.

Kate I. Rush is now at the Department of Psychology and Human Behavior, Brown University.

We dedicated these experiments for the Publication Manual, although we assumed, on the basis of past research, that the hypotheses we examined had face validity.

We thank Donna B. Oberholzer, Claire J. Reinburg, and Frances Y. Dunham, who ranked the sentences, and those who kindly volunteered to participate in the study. We also thank Linda D. Garlet for preparing the artwork.

Correspondence should be addressed to the author obtained from the author not exist. In submitted address of the author we had actually treated hemisphere introduction, would the cerebral

Footnotes

1 If poetry specialists had been consulted, we would have expressed appreciation here to our colleagues Ronald V. Evans, University of West Florida; Harold Pepinsky, Ohio State University; and Bonnie J. J. Meyer, Arizona State University, for their assistance in choosing a poem.

2 For the sake of brevity, we have reported only a

Table 1

<table>
<thead>
<tr>
<th>Type of Processor and Passage</th>
<th>Exposition</th>
<th>Poetry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading alpha data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytic</td>
<td>0.93</td>
<td>1.76</td>
</tr>
<tr>
<td>Holistic</td>
<td>3.96</td>
<td>1.98</td>
</tr>
<tr>
<td>Recall alpha data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytic</td>
<td>0.71</td>
<td>1.93</td>
</tr>
<tr>
<td>Holistic</td>
<td>2.64</td>
<td>0.82</td>
</tr>
</tbody>
</table>
Figure 5.1. (continued)

Figure Caption Captions, 3.84, 5.22

Figure 1. Mean proportional recall as a function of type of processor, passage, and level of subordination.
Figure 5.2. Outline of the text of a sample two-experiment paper. The circled numbers refer to numbered sections in the *Publication Manual*. This abridged manuscript illustrates the organizational structure characteristic of multiple-experiment papers. Of course, a complete multiple-experiment paper would include a title page, an abstract page, and so on.

Effect on Prose Recall of Individual Differences in Cognitive Style

Recently researchers have shown increased interest in the relation between cognitive style differences and comprehension of text. Several researchers in this area have attempted to show (Wolk & DuCette, 1974; Spiro & Tirre, 1980) that together, these constructs have a significant impact on the cognitive-style differences observed by Dunn (in press). . . .

Method

Participants. Sixteen college students, 10 men and 6 women, served for the study. . . .

Materials. Four experimental conditions were employed. . . .

Personality and cognitive style descriptions of the three styles measured for each individual were obtained from text. . . .

Results

All data were converted to z scores, and with Pearson product-moment correlations, a correlation matrix was generated (see Table 1). Because the multiple independent and dependent variables were related, I analyzed the data using the Statistical Analysis System canonical correlation routine (Barr, Goodnight, Sall, & Helwig, 1976). . . .

Discussion

The results of Experiment 1 indicate that although locus of control and field dependency correlated with the set of dependent variables, they did so only through their correlation with the alpha activity index of analytical processing.

Because only highly logical verbal materials were used in Experiment 1, it could be argued that this study measured only quantitative differences in analytical processing. Experiment 2 was designed to identify qualitative differences between styles. . . .
college students (20 women and 20 men, mean age = 21.7 years) volunteered to participate. . . . [section continues].

**Materials.** A 205-word poem by Fyodor Sologole (cited in Markov & Sparks, 1966) titled "The Devil's Swing" was selected because three poetry specialists who were consulted agreed that the poem was full of imagery and nonanalytical content. . . . [section continues].

**Design and procedure.** The design and procedure were identical to those of Experiment 1, except that the students read only one passage. . . . [section continues].

**Data scoring.** Two independent raters judged participants' recall protocols and determined which recalled sentences were contained in the previously described semantic hierarchy. . . . [section continues].

**Results.** A correlation matrix on the z-transformed data again showed that the predictor variables—analytical processing, locus of control, and field dependency—were significantly intercorrelated (ps < .01). . . . [section continues].

**General Discussion.** The results of both experiments strongly suggest that the analytical processing dimension is a better predictor of individual differences in the recall of higher order information from text than are the personality constructs of locus of control and field dependency. . . . [section continues].

[Follow the form of the one-experiment sample paper to type references, the author note, footnotes, tables, and figure captions.]
Figure 5.3. Outline of the text of a sample review paper. This abridged manuscript illustrates the organizational structure characteristic of review or theoretical papers. Of course, a complete review or theoretical paper would include a title page, an abstract page, and so on.

Analytical Cognitive Style

Analytical Cognitive Style as a Factor in Memory for Text

Cognitive or personality style differences traditionally have been ignored in the field of human learning and memory (Eysenck, 1977). This situation is surprising, given the growing body of literature showing that individuals differ in how they encode and retrieve simple and complex verbal information (for summaries, see Eysenck, 1977, and Goodenough, 1976). The present review has two purposes: (a) to demonstrate that when the popular personality and cognitive constructs (Rotter, 1966) and field dependency (Goodenough, & Karp, 1962)—are used in recall studies, similar results are obtained, and (b) to suggest that this similarity indicates that the same processes are involved in both. The results of Bartel, Ducette, and Wolk (1972) indicate that only those with an internal locus of control use this strategy. ... [section continues].

Research on Recall

The argument that people with an external locus of control and those with an internal locus of control use different strategies to encode and retrieve simple word lists can be made when complex material serves as the stimulus. ... [section continues].

Field Dependency

A field-independent person, in contrast to a field-dependent person, can overcome an embedding context and can deal with a perceptual field analytically. ... [section continues].

Research on Learning Word Lists

Researchers obtain results similar to those found in the locus-of-control literature when they use field dependency as the individual-difference construct in studies done with simple verbal material. ... [section continues].

Research on Text Recall

Annis (1979) has found individual differences in field dependency and text recall that parallel those found in a...
Relationship of Locus of Control and Field Dependency With Analytic Processing

The constructs of locus of control, field dependency, and analytic processing style are related to a certain extent because the definitions of the constructs overlap. The overlap in the constructs occurs because of shared behavior referents. . . . [section continues].

Conclusions

Although the constructs of locus of control and field dependency generally measure different aspects of personality and cognitive functioning, they appear to measure the same degree of text encoding. That factor appears to be individual differences in analytic and holistic processing. . . . [section continues].

[Follow the form of the one-experiment sample paper to type references, the author note, footnotes, tables, and figure captions.]