IMAGERY LEVEL OF TEXT: TENTATIVE OBSERVATIONS

PAUL TERWILLIGER AND BRENDA KOLKER

University of Tennessee

The concept of imagery is not a new one. Wundt (1884) thought that all thought processes were accompanied by mental images, whereas Huey (1908) maintained that relational and connective words had no imagery. What is the elusive imagery? For the purposes of this paper, mental imagery is defined as a mental representation of a pictorial form elicited by an isolated word or a group of words. It is the mental representation one uses to answer a question such as: Does a racehorse have a braided tail? The definition of mental imagery denotes an internal representation involved in thought (Brock, p. 9), and these images are not photographic pictures in the mind but are representations underlying the experience of seeing (Kosslyn, 1980, p. 18).

Imagery is an important concept for both education and research because by gaining more insight into the "how's" of imagery in mental representations, we gain more insight into how people learn and retain information. The primary purpose of this paper was to determine whether text itself could be coded on an imagery factor. Then, a later step would be to determine whether student reading comprehension is affected by the imagery level of the text. This paper will report the procedure(s) used to code the imagery level of text.

RATIONALE'

Imagery appears to be closely aligned with the concepts of concreteness and abstractness. Kosslyn's (1980) idea that images are representations underlying the experience of seeing assumes concreteness, especially for a beginning "seer." We can see a "racehorse," but not an "of."

Another aspect of mental imagery is that it appears to be a developmental learning phenomena. Pressley's (1977) review of research examined the conditions under which imagery increased children's learning of verbal materials. His summary and discussion related to specific task situations in paired-associate learning, recognition, recall, verbal discriminating learning, and prose learning. Nursery school children did appear to have the learning facility to internally elaborate; the six and seven year old children could internally elaborate for the paired-associates; and the older children could internally elaborate for prose. This type of information supported Pressley's (1977) conclusion that internal visual elaboration is a developmental process.

The child's learning of sight vocabulary words, which requires instant recognition, would fall into Pressley's (1977) paired-associate task paradigm. Children have to see the printed word and pair its visual stimulus with an existing response to that printed word. A child's instant recognition of the word indicates prior experiences which have been

associated with a visual representation and incorporated into his existing learning schema. What would happen if the word is so abstract that a mental image is not forthcoming immediately? Kosslyn's (1980) conclusion that images can affect cognitive processing is a possible application in that it could suggest that primary grade young children who have image representations of words would learn them more quickly than words with which they had little or no image representation.

As a test of this hypothesis, Kolker and Terwilliger (1981) conducted a study of the comparison or rates of beginning first and second grade children's learning of high and low imagery nouns as sight vocabulary words. The randomly selected children were pretested individually to determine if they could recognize instantly the printed words taken from the Paivio, Yuille, and Madigan List (1968) and if they could give the meaning of the unrecognized word when presented orally to them. The words which the child did not recognize instantly but had a knowledge of their meanings comprised the word sets for systematic sight word drill. Responses of the daily individual word drills with these noun flash cards were recorded over a three-week period. The "learned words" which were compared for differences in rates of learning evolved from the sequence of (1) three consecutive final responses out of five on any given day (2) a correct response the next day in one flash presentation (short term recall) and (3) a correct response 72 hours later in a one flash presentation (delayed recall). Repeated analyses of variance indicated support to the conclusion that both beginning first grade and second grade children could be expected to learn in isolation as sight words the high imagery nouns more rapidly than the low imagery nouns. A comparison of the mean scores of the first and second grade children indicated similar pattern of learning but a substantial difference in the rate of learning (first graders $X = 17.31$; second graders $X = 6.84$) for the high imagery words. It was concluded that the coded imagery level of a word appeared to be a source of prediction for the rate of a first and second grade child's learning a sight word in isolation.

Pressley's (1971) review of mental imagery and its relationship with learning indicated that the bulk of research to that time had been done within the paired-associate learning paradigm. However, a paired-associate framework is not an accurate description of prose or text processing. If mental imagery representations affect word processing in isolated paired-associate learning tasks, would the imagery representations also affect prose or text processing? More recent research has studied imagery and its effect on the comprehension of prose or text. Several of these studies have provided imagery instructions to elementary children of third grade and above prior to their reading the text (Miccinati, 1981; Prawat and Kerasotes, 1979; Steingart and Glock, 1979; and Gambrell, 1981). These studies reflect the procedure commonly called induced imagery, that is, the experimentor induces imagery in the child's cognitive processing by giving prior instructions. Typically, the children are assigned to an experimental or control group, and prior to reading, the experimental group is instructed to make pictures in their heads to help them remember the story as they read (Gambrell, 1981). The children either respond to prediction questions after reading or answer questions relating to what they have read (Miccinati, 1981). From the induced imagery type of study it has been noted that induced imagery instructions to middle and upper elementary school children have improved their level of comprehension of what they read (Miccinati, 1981; Prawat and Kerasotes, 1979; Steingart and Glock, 1979; and Gambrell, 1981).

In many studies of the imagery effects on text processing, the passages which the children were required to read were determined in various ways. A readability formula was used in the selection of an appropriate grade level of the passage to be read (Gambrell, 1981) or, children rated the passage or sentence read as having either high or low imagery (Eddy and Glass, 1981). In the readability type of text rating, the length of sentences and number of syllables determined the grade level of the passage; the imagery level of words was not scrutinized. In the child's imagery rating type of test rating the content of the passage itself was varied. In this type, only the cognitive processing of the child was recognized. Neither of these types of text rating seems concerned with the imagery value of the words in the passage itself.

As a result of their previous studies into the effects of imagery on learning words, Kolker and Terwilliger (1981) accepted the position of those who thought that the level of imagery of prose passages to be an apparent factor in the child's learning from prose or text. However, there appears to be neither a rationale nor a mechanism, readily available in the literature, to determine whether a passage can be rated as having high imagery or low imagery. Therefore, the purpose of this discussion is to provide a tentative mechanism to ascertain the imagery level of a prose or text passage.

METHOD

Description of Word Lists

Isolated words have been classified on the levels of high and low imagery, and concreteness and abstractness (Paivio et al., 1968; Toglia & Battig, 1978). The Paivio et al. (1968) list contains 925 nouns taken from the Thorndike-Lorge List (1944). The Thorndike-Lorge List (1944) was based on frequently occurring words in English. College students rated Paivio's 925 nouns on a seven point scale to determine I (imagery), C (concreteness), and m (meaningfulness). The standard deviation was computed for each words ratings. For example, the word/arrow/had a mean I value of 6.57 with a standard deviation of 1.07, while /boredom/ had a mean I value of 3.83 with a standard deviation of 1.63.

The Toglia and Battig (1978) list contains 2854 words, enlarging the Paivio et al. (1968) list. Toglia and Battig (1978) invited researchers to send them lists of words to code which would be useful in further research. The lists coded by Toglia and Battig (1978) included rhyming words, homophones, synonyms, conceptual categories such as Shapiro-Palermo (1970) category norms, and stimulus words of Postman and Keppel (1970). Undergraduate college students completed the ratings for concreteness, imagery, meaningfulness, familiarity, and pleasantness, similar to the procedure used by Paivio et al. (1968).

Description of Text Coding

Text passages were selected from fourth grade basal readers. The basals selected were texts not used in area schools because

of possible pupil knowledge of the text when stories were presented to pupils to read. Selections of 150 to 200 running words were taken from 40 different stories.

The Paivio et al. (1968) list of nouns was then classified by the experimentors into three categories for computer input: low imagery words (X = 1.0 — 3.9), middle imagery words (X = 4.0 — 5.9), and high imagery words (X = 6.0 and above).

A SNOBOL computer program was written to match the words in the passages with the words in the Paivio List. The computer printout for two sample passages looked as follows:

Text 1

From: Words:High — Gave 320 words, matched From: 14 words
From: Words:Middle — Gave 340 words, matched 0 words
From: Words:Low — Gave 257 words, matched 0 words

Text 2

From: Words:High — Gave 320 words, matched 5 words
From: Words:Middle — Gave 340 words, matched 0 words
From: Words:Low — Gave 257 words, matched 0 words

In Words:High, the Paivio High Imagery nouns dictionary, the 320 words in the dictionary matched only 14 times with nouns in text passage one and only five times in the text passage two. The investigators ran 10 text passages in a trial run and noted that it was very obvious that a more accurate imagery level of the text required a rating of the other parts of speech in the text. Simply, five nouns would not be a very valid indicator of either a high or low imagery level text, especially when the total words ranged from 150-200.

Therefore, the Toglia and Battig (1978) word list which included all parts of speech was classified into three imagery levels for computer input: low imagery (1.0-3.29), middle imagery (3.30-5.49), and high imagery (5.5-8.0) to be used in combination with the Paivio et al. (1968) list. These level ranges were established to accommodate the ratings of the Paivio words which appeared on the Toglia and Battig (1978) word list. Thus, words common to both word lists were counted once and represented similar levels of imagery. The total number of dictionaries for computer input was nineteen : Paivio list — three noun levels; Toglia and Battig list — three noun, three adjective, one conjunction, three verb, two preposition, two adverb, and two pronoun levels. Some parts of speech did not reflect value ratings for all three levels of imagery. For example, on the Toglia and Battig (1978) list there were no words on the conjunction high or middle, preposition high, adverb high, or pronoun high word dictionaries.

The SNOBOL program was run again and this time both word lists were matched to each of the 40 text passages. As seen in the following replication of a computer printout for text passage two, there were 15 words in the Prep:Low dictionary but there were 17 matchings. Of these 17 matchings there were four occurrences of "for," two occurrences of "from," four occurrences of "of," two occurrences of "on," and five occurrences of "to."

Text 2: Computer Printout

From Words:High*	Gave 320 words	Matched 5
From Words:Middle*	Gave 340 words	Matched 0
From Words: Low*	Gave 257 words	Matched 0
From Noun:High	Gave 603 words	Matched 4
From Noun:Middle	Gave 624 words	Matched 7
From Noun:Low	Gave 200 words	Matched 1
From Adj:High	Gave 20 words	Matched 0
From Adj:Middle	Gave 301 words	Matched 13
From Adj:Low	Gave 64 words	Matched 29
From Conj:Low	Gave 27 words	Matched 12
From Verb:High	Gave 26 words	Matched 0
From Verb:Middle	Gave 451 words	Matched 4
From Verb:Low	Gave 87 words	Matched 18
From Prep:Middle	Gave 7 words	Matched 2
From Prep:Low	Gave 15 words	Matched 17
From Adv:Middle	Gave 16 words	Matched 2
From Pron:Middle	Gave 13 words	Matched 1
From Pron:Low	Gave 7 words	Matched 2

*Paivio et al. (1968) list.

Each of the forty text passages had a similar computer printout. Each text passage printout was coded by the investigators in the following manner (Table 1):

Table 1

Coding of Each Text From Computer Printouts

	Text	Nou(P)	Nou(B)	ADJ	CONJ	VERB	PREP	ADV	PRON	Total
	H	5	4	0	0	0	0	0	0	9
2	M	0	7	13	0	4	2	2	1	29
	L	0	1	29	12	18	17	2	2	81
	H	1	20	1	0	0	0	0	0	22
4	M	2	5	9	0	12	4	0	6	38
	L	1	0	30	9	12	24	5	2	83
	H	7	1	0	0	0	0	0	0	8
6	M	1	4	6	0	17	1	1	5	35
	L	0	0	15	10	8	23	2	1	59

Text 2, for example, contained a total of nine high imagery (H(words, 29 middle imagery (M) words, and 81 low imagery (L) words. Now the questions was: How does one use the figures obtained from the computer to determine a high or low imagery classification? Would one category of words be a better predictor of imagery level or a combination of categories?

Since a reader would have to read every word in the passage, it was decided to count each word occurrence. Observation of the ratio of the high imagery words to the low imagery words clearly indicated that in every instance, the low imagery words exceeded the high imagery words. This can be seen from Table 1. There were nine imagery (H) words and 81 low imagery (L) words for Text 2; 22 H and 83 L for Text 4; and 8 H and 59 L for Text 6. Thus, the identification of a high imagery passage would have to be based on a 1:1 ratio: that is, a H to L ratio.

The investigators arbitrarily elected to use three groups of ratios because of the distribution of H and L of the forty texts. There was not a 1:1 ratio in any of the forty passages. Thus

the investigators decided to classify H passages as close to the 1:1 ratio as possible. The arbitrary ratios fell into three categories. Twenty-five percent of the forty sets of ratios comprised the high level text, fifty percent the medium level text, and twenty-five percent the low level text. The range of the H to L level ratios was high level 1.0:2.3, to 1.0:3.9; medium level 1.0:4.0 to 1.0:5.9; and low level 1.0:6.0 to 1.0:9.0. This classification provided two extreme sets of imagery levels and reduced the effect of borderline passages.

The intent of the study was to determine whether text could be coded on an imagery factor. The results suggest that an operant option has been defined. Other tentative options may include varying the numerical values for imagery levels of words, and varying the range of high-low ratios. Also, a greater number of passages may provide more critical percentage ratios; however, a set of twenty passages produced the same pattern as did the forty passages.

REFERENCES

Brock, N. (1981). *Imagery.* Cambridge: MIT Press.

Gambrell, L. (1981, December). *Induced mental imagery and the text prediction performance of first and second graders.* Paper presented at the annual meeting of the National Reading Conference, Dallas, TX.

Huey, E.B. (1968). *The psychology and pedagogy of reading.* Cambridge: MIT Press.

Kolker, B. & Terwilliger, P. (1981). Sight vocabulary learning of first and second graders. *Reading World, 20,* 251-258.

Kosslyn, S.M. (1980). *Image and mind.* Cambridge: Harvard University Press.

Miccinati, J. (1981). Use visual imagery to enhance recall of information. *Reading World, 21,* 139-145.

Paivio, A., Yuille, J.C. & Madigan, S.A. (1968). Concreteness, imagery and meaningfulness values for 925 nouns. *Journal of Experimental Psychology, 76,* 1-25.

Postman, L. & Keppel, G. (1970). *Norms of word association.* New York: Academic Press.

Prawat, R.S. & Kerasotes, D. (1979). Children's use of imagery in accessing different types of semantic information. *Journal of Experimental Child Psychology, 28,* 404-415.

Pressley, M. (1977). Imagery and children's learning: Putting the picture in developmental perspective. *Review of Educational Research, 47,* 585-622.

Shapiro, S.I. & Palermo, D.S. (1970). Conceptual organization and class membership: Normative data for representatives of 100 categories. *Psychonomic Monograph Supplements, 3* (11, whole No. 43).

Steingart, S.K. & Glock, M.D. (1979). Imagery and the recall of connected discourse. *Reading Research Quarterly, 15,* 66-83.

Thorndike, E.L. & Lorge, I. (1944). *The teachers word book of 30,000 words.* New York: Teachers College.

Toglia, M.P. & Battig, W.F. (1978). *Handbook of semantic word norms.* Hillsdale: Lawrence Erlbaum Associates.