Conditions for a Picture-Superiority Effect on Consumer Memory

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Based on three explanations of imagery effects on memory, hypotheses regarding the conditions under which pictorial ads are or are not remembered better than verbal-only ads are generated and tested. The memorability of brand names semantically related to product class was tested in pictorial versus verbal-only form under various conditions. The results indicate that picture superiority occurs in both immediate and delayed recall tasks when processing is directed at appearance features. Verbal-only stimuli are recalled as well as pictures in immediate recall but become inferior once again in delayed recall, when processing is directed at the semantic content of the ads.

Information presented in verbal and/or pictorial form is a fundamental feature of the consumer information environment, especially when nonpersonal marketing stimuli (e.g., advertisements, point-of-purchase displays) are considered. The substantial amount of research on consumer information processing has, however, assumed or imposed a verbal processing paradigm only (cf. Holbrook and Moore 1981). Relatively little attention has been given to nonverbal information processing and even less to comparisons of the effects of verbal versus pictorial information. Given the prevalence of pictorial information in the consumer's environment (especially in combination with verbal information), more research is needed that examines and explains their relative effects.

At least two lines of research on picture–word effects seem appropriate in consumer research. First, reflecting a common marketing objective of increasing "top of the mind" awareness and recall of a brand or company name, research that examines the differential effects of pictures and words on memory is useful. Second, research that examines the effects of pictorial versus verbal information on consumer judgment (e.g., product beliefs) is appropriate. There are a limited number of examples of either type of research in the consumer behavior literature. Lutz and Lutz (1977) have examined picture–word effects on memory, while Holbrook and Moore (1981), Wright and Rip (1980), Kisielius and Roedder (1983), and Edell and Staelin (1983) have studied picture–word effects on consumer judgments. Although more research of both types is needed, the concern here is with picture–word effects on memory.

The literature on picture–word effects is sparse in consumer behavior, but there is an extensive literature base in cognitive psychology. One of the most pervasive findings is that pictures are more memorable than their verbal counterparts. Numerous studies have shown that pictures are more easily recalled or recognized than words (see Paivio 1969 or Lutz and Lutz 1978 for reviews). The dominant explanation for the stronger presence of pictures in memory focuses on their superior ability to evoke the use of mental imagery—the process by which a previously experienced stimulus is recreated in one's mind. While imaginal processing can occur with respect to all of the senses, visual imagery is relevant to understanding picture effects.

Visual imagery is a rich mnemonic device that enhances learning and retention of material over such techniques as sentence elaboration or rote rehearsal (Paivio and Foth 1970; Yuille 1973; Lippman and Shanahan 1973; Morris and Stevens 1974; Peterson and Murray 1973; Peterson and McGee 1974; Robbins et al. 1974).[1] It is even more powerful when the to-be-remembered objects are depicted as interacting in some manner (Bower 1972). Within the paired associate learning paradigm, an interactive image occurs when all components of the scene are depicted in a unified context. If the paired associates to be learned were a whale and cigar, a mental picture of a whale smoking a cigar would qualify as an interactive image. In paired associate learning, the subject's task is to be able to as-

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[1] Several different types of mental imagery exist in addition to visual imagery; but to conserve space, imagery and mental imagery will both be used interchangeably for mental visual imagery.

sociate a target (cigar) when provided the stimulus (whale). Note that imagery effects are not unique to nonverbal learning. Imagery also enhances the performance of verbal learning tasks. See Kieras (1978) for an excellent review of imagery effects on verbal memory.

While the picture superiority effect on memory has been observed numerous times, it is not an exclusive finding. Evidence exists to suggest that under certain conditions, verbal-only material is learned as readily as pictorial material. For example, in the study by Lutz and Lutz (1977), interactive pictures, noninteractive pictures, and their verbal counterparts were taken from advertisements in the Yellow Pages of telephone books and compared in terms of their impact on memory recall. Interactive pictures consisted of those in which the brand name and product class were both depicted in a visual format. Noninteractive pictures (brand or product class imagery) consisted of either the brand shown in a visual format or the product class shown in a visual format, while the control consisted of simply the brand–product-class verbal referents without an accompanying picture. Only in the case of interactive pictures was the learning of pictures superior to words.

More research is needed in consumer behavior that examines the conditions under which the picture superiority effect is retained or eliminated. The potential implications of such research are important. Aside from the obvious implications for improving consumer learning, there are economic consequences. The inclusion of pictorial material in print ads, for example, adds substantially to advertising production and media placement costs. Such research would offer a basis for anticipating when these added costs are justified or unnecessary.

The major purpose of this paper is to offer conceptual and empirical evidence regarding the conditions under which consumer information stimuli containing pictures can or cannot be expected to be learned more readily than their verbal-only counterparts. First, three major classes of explanations of *imagery effects* on learning are reviewed. If pictorial material enhances the use of imagery during the encoding of a stimulus, then an understanding of why imagery in general is an effective mnemonic should provide further understanding of the pictorial superiority effect. Second, from these explanations several hypotheses regarding the presence or absence of a picture superiority effect on memory are offered. Third, the procedures and results of an experiment designed to test the hypotheses are presented. Finally, the implications of the findings are discussed.

EXPLANATIONS OF IMAGERY EFFECTS

In this section three conceptual explanations for the effectiveness of imagery as a learning mediator are reviewed. Given the high-imagery nature of pictures, these explanations should provide ideas about what is happening when pictures are being processed. Correspondingly, they should suggest the conditions that the processing of words-only must attain in order to be remembered as well as pictures.

Bower (1972) reviewed the literature on imagery effects, including several explanations for these effects in a paired associate learning (PAL) context. The PAL context seems to be an appropriate one for consumer research because a key aspect of consumer learning is the association of a brand name with a product class. Three major classes of explanations were offered. Each class contains variations with a common theme vis-à-vis understanding imagery effects. The interest here is with the key distinctive feature of each class of explanation. This level seems most appropriate for applied consumer research, given its early stage of development in the study of imagery.

Individually, each explanation represents a conceptually distinct treatment of imagery effects and, as such, competes with the other explanations. However, our perspective is to treat them as a collective basis for generating hypothesized conditions under which picture superiority effects can be expected in a consumer research context.

Incidental Redundant Cues

This explanation centers on the richness of the image in providing multiple cues that could serve as aids to memory retrieval. When imaging a stimulus, a large number of incidental cues are contained within the image. For example, an image for a particular product might be of that product being used in a certain setting or activity. The word "beer" may evoke an image of sitting around the clubhouse after a gratifying round of golf. Incidental cues within the image might be background objects, regular golf partners, or clothes that one is wearing. If the imaginal scene contains more cues than the word "beer" alone, this additional information is stored, multiple retrieval paths are provided, and memory is enhanced. The notion of multiple retrieval paths is contained in a number of specific explanations, including Paivio's (1971) classic dual-code theory and the availability explanation that has received some attention in the consumer behavior literature (e.g., Kisielius 1982). The latter argues that multiple retrieval paths increase the availability of material in memory.

The redundant cue explanation argues that imagery involves a form of elaboration that yields stored semantic information beyond that contained in the original stimulus. Thus for verbal material to be remembered as well as pictures, it would have to be processed at a semantic level and be of a form that generated additional information that resulted in multiple retrieval paths. Brand–product-class associations that contain meaning beyond the mere nature of the product class and its label (brand name) would be one way to operationalize such verbal material in a consumer behavior study. For example, Rhino Tire Company provides additional meaning be-

yond, say, Bell Tire Company in that it conveys semantic information about an attribute of the brand (e.g., durability).

Relational Organization

The relational organization explanation argues that imaginal processing of paired items allows the individual to find a connective relationship between the items. This connection may be achieved by relating two objects or nouns as grammatical subject and object through a verb or preposition. The verb or preposition serves to strengthen the linkage between the two objects, thereby allowing easier recall of one term when provided with the other term. To obtain the facilitation it is important that the connective term provide a "meaningful" association between the two terms (Bower 1970; 1972). For example, "dog numbering bicycle" would not be expected to facilitate retrieval of a target given a stimulus cue because the connective has no meaningful association with one's prior experiences or knowledge of the concepts dog and bicycle. "Dog riding bicycle" would be expected to aid retrieval. Imagery, it is argued, enhances the use of meaningful connectives.

A variant of the relational organization explanation seems particularly relevant to nonverbal stimuli. Imagery is a versatile method for depicting spatial relationships among objects such that perceptual unity is achieved. Bower (1970) suggests that relational organization of this type explains the findings that two pictured objects are more easily associated when shown in some kind of spatial interaction (e.g., rock breaking bottle) as opposed to showing them side by side.

Semantic elaboration has been shown to improve the learning of pictures, a type of stimulus that, as noted earlier, enhances the use of imaginal processing. Bower et al. (1975) conducted an experiment using nonsensical pictures and then provided half of the subjects with a meaningful interpretation. Those receiving the interpretation recalled 70 percent of the stimuli while those not receiving a label recalled only 51 percent of the pictures, thus demonstrating the role of semantic elaboration on memory performance.

In a second experiment, subjects studied parts of nonsensical pictures, with half receiving an interpretation that linked the two pictures together. Using cued recall, subjects receiving a linking interpretation recalled 73 percent of the pictures while the noninterpretation group recalled only 44 percent of the pictures. Results of the second experiment indicate the elaboration of two pictures provides for unification or knitting together of the disparate parts into a coherent whole (Bower, Karlin, and Dueck 1975).

As with the redundant cue explanation, elaborative processing is the key to the imagery effect. However, in relational organization it is the elaborate encoding of associative relationships among the stimulus components that aids memory, not the additional cues that are generated. The result is a stronger single memory trace and retrieval path. The memory trace is enhanced by the strength of the connective linkages provided in the image.

The relational organization explanation suggests that for verbal-only material to be learned as well as pictures, processing at a semantic level is necessary. Furthermore, the verbal material should be of a form that promotes cohesion within it. Brand–product-class associations that semantically link the brand name with the product class would allow equivalent learning of verbal-only and pictorial representations of the object. An example would be Gateway Fence Company.

Stimulus Differentiation

The stimulus differentiation argument suggests that imagery results in a *more distinctive, more isolated* single memory code. As Bower (1972, p. 78) indicates:

> By distinctive I mean that the imaginal complex is better differentiated from the other stimuli in the list, as though a distinctive color has been attached to each cue word. Distinctiveness thus implies less intra-list interference, less confusions among pairs, and more accurate recall.

In this sense, the stimulus is differentiated from among other stimuli in an attempt to maximize differences between stimuli. As a result, the paired items are more resistent to interference, allowing recall to be higher (Bower 1970).

The essence of the stimulus differentiation hypothesis is that imagery is a more *reliable* encoding process than verbal encoding (Bower 1970). In verbal encoding, less stability between items occurs when selecting a functional cue from a word. In one occasion a letter is selected, while in a subsequent occasion a syllable is selected. This lack of stability between items lowers the level of recall in verbal processing. With imaginal encoding a more consistent, more stable form of processing occurs between the items, yielding a more distinct memory trace. The stimulus differentiation explanation is essentially arguing that imagery promotes encoding that focuses on the contrastive nature of a stimulus and allows each stimulus to be reliably processed. Imagery provides greater access to the distinct nature of the stimulus.

The stimulus differentiation explanation of imagery effects seems to be consistent with the notion of encoding distinctiveness (Jacoby and Craik 1979). Encoding distinctiveness refers to the tendency of an individual to discriminate one stimulus from another at encoding. Here the concern is with the extent to which encoding focuses on the unique features of a stimulus. Thus, in comparison to elaboration, distinctiveness of encoding refers to the contrastive value of what is encoded rather than to the quantity of information encoded (Jacoby and Craik 1979). The ability to distinctively encode is, of course, a function of the distinctiveness of the stimulus itself. Encoding dis-

tinctiveness is not as viable when a stimulus overlaps with a stream of stimuli.

Nelson, Reed, and Walling (1976) attribute the picture superiority effect to encoding distinctiveness at the sensory level of processing. They argue that in comparison to words, pictures yield qualitatively superior sensory codes. The lines and curves comprising the pictorial vocabulary are more distinctive than the lines and curves comprising the typical set of words. These distinctive components, when imaged, produce superior sensory codes which serve to aid in the differentiation of a stream of stimuli at encoding. In a series of experiments, Nelson et al. (1976) demonstrate that high schematic similarity among pictorial stimuli reduces or reverses the superior recognition performance for pictures. They also conclude that meaning representations for simple pictures and words are functionally identical and thus that the pictorial effect is produced by more distinctive sensory codes.

The stimulus differentiation explanation of imagery and the specific picture superiority explanation of Nelson et al. are conceptually quite different from the previous explanations. However, their implications for when picture superiority effects should hold are very similar. The unique sensory features of pictures allow them to be encoded more distinctively. Words do not lend themselves to sensory discrimination. Thus, when processing occurs at a more shallow sensory level, pictorial material should be more readily learned than verbal-only material. However, when pictures and words are equivalent in meaning (either through redundant cues or relational organization) and elaborative processing at a semantic level occurs, the picture superiority effect should be removed.

HYPOTHESES

Based on the above discussion, formal hypotheses regarding the presence or absence of a picture superiority effect can now be stated. Collectively, the three imagery explanations suggest conditions that verbal-only material must achieve to match the memorability of pictures. The stimulus differentiation explanation suggests that imagery allows greater distinctiveness of encoding and more reliable processing. In a similar vein, Nelson et al. (1976) argue that the distinct sensory features of pictures account for their superior memorability. The incidental-redundant-cues and relational-organization explanations suggest that imagery is a form of semantic elaboration yielding either multiple retrieval paths or a stronger single memory trace, respectively.

It is doubtful that verbal-only material can achieve the level of sensory discrimination that pictures allow. However, verbal material containing a meaning similar to pictures and processed at a semantic level indicates the learning conditions that imagery achieves. Therefore, the following key hypothesis is offered for testing:

H1: Pictorial material conveying brand–product-class associations is recalled better than corresponding verbal-only material when each is processed at a sensory level. The picture-superiority effect is eliminated when each is processed at a semantic level.

Of further interest is whether Hypothesis 1 holds for stimuli constructed along the lines suggested by the incidental-redundant-cues and relational-organization explanations of imagery effects. Therefore, Hypothesis 1 is further tested for pictorial and verbal material (1) when each type of material is designed to promote redundant cues and (2) when each is designed to promote a relational organization between brand and product class.

Finally, if the sensory features of pictures account for their superior memorability, then further sensory discrimination of pictures should magnify their superiority in memory. Therefore, the following hypothesis is offered for testing:

H2: Greater sensory discrimination of pictures improves their recall over corresponding verbal-only material when each is processed at a sensory level. This effect is eliminated when each is processed at a semantic level.

RESEARCH DESIGN AND PROCEDURES

Research Design

Two major concerns guided the development of the design. First, the design had to accommodate the testing of the previously stated hypotheses. Therefore, a mix of stimuli had to be developed that would promote the type of processing suggested by the three theories on which the hypotheses are based. Second, the specific stimuli needed to be of a type that represented consumer information. In this way the findings and implications of the study could be more directly linked to consumer behavior and the consumer information environment.

The design of the study involved the manipulation of four factors in a full $2 \times 2 \times 2 \times 2$ factorial design. These factors, whose specific operational features are discussed in a subsequent section, included:

1. *Type of stimulus*—A necessary manipulation involved pictorial stimuli versus verbal stimuli.
2. *Depth of processing*—Based on the levels-of-processing framework for memory research (Craik and Lockhart 1972; Craik and Tulving 1975), depth of processing was manipulated at either a sensory level or semantic level.
3. *Level of meaning*—Processing conditions suggested by the redundant-cue and relational-organizational explanations were varied in a single manipulation. A high-meaning condition in which additional product information beyond brand–product-class identification was contained in the brand name represented the processing conditions suggested by the redundant-cue explanation. A low-meaning condition in which such additional in-

formation was not available represented the relational-organization conditions.

4. *Degree of sensory distinctiveness*—To test whether greater sensory discrimination of pictures enhanced their memorability, high and low degrees of sensory discrimination among stimuli were represented in the design.

Randomly assigned subjects in each of the 16 cells were exposed to a series of stimuli corresponding to their cell assignment. The key dependent variable was the number of stimuli correctly recalled.

Subjects

Experimental subjects were recruited from the undergraduate introductory marketing course at a major Midwestern university. The study was conducted early in the semester, prior to student exposure to course material related to the creation of advertising messages. A total of 271 subjects participated in the entire study. Subjects were randomly assigned to experimental treatments. There were 16 to 20 subjects in each of the 16 cells of the experiment. The variations in cell sizes are due to the failure of some recruited subjects to complete the entire study.

Stimulus Materials

Stimulus materials were selected from the Yellow Pages of metropolitan telephone directories. To be eligible for selection an advertisement had to:

1. Be unfamiliar to subjects
2. Include a picture such that both the product and brand or company name were displayed
3. Contain no artifact that would render it easily recallable.

To increase the likelihood that subjects were not familiar with the brands and companies promoted in these advertisements, telephone directories of cities distant from the site of the study were used. To reduce the likelihood that recall would be attributable to other than manipulated factors, stimuli were excluded if they possessed certain mnemonic relationships. Pictures with verbal labels that were phonetically similar were not selected. Also, word pairs were not used when the product itself served as a cue or a prompt for the brand name, or where rhyming or alliteration could have rendered the pair easily recallable (e.g., Bob's Bait Barn). Brands with familiar city and geographic names were also excluded from consideration. Ninety-four pictures that were interactive and met these criteria were pooled together to be examined for information content.

Several pretests were then conducted to arrive at a final set of stimuli to be used in the study. The purpose of the pretests was to distinguish between high-meaning and low-meaning pictures. Seven-point semantic differential rating scales specific to the semantic content of a stimulus were used to measure the amount and nature of meaning conveyed by each stimulus. From this process, two groups of 20 picture–brand-name stimuli emerged. One group consisted of high-meaning stimuli with an average rating of 5.7 on the meaning scales; the other group contained low-meaning stimuli with an average rating of 4.0.

The 40 stimuli were then professionally reconstructed by a commercial artist. The purpose of the reconstruction was to equate the size of illustration and the complexity of background in the original stimuli. The reconstructed pictures were then pretested again to ensure that the level of information content in each stimulus had not been changed. The reconstructed high-meaning stimuli averaged 5.9 while the low-meaning stimuli averaged 4.5. The stimuli were then photographed and developed on 35 mm slides.

Procedures

The general framework of the experiment conformed to the classic paired associate learning paradigm. Taped instructions to subjects were designed to obscure the purpose of the study and contribute to the depth of processing manipulation (to be discussed in the next section). The cover story emphasized that the purpose of the study was to evaluate advertisements. Subjects were told that they would perform an evaluation task but were not told that they would be asked to recall the stimuli. Thus, the intent was to achieve an incidental learning situation, one common to much of consumer learning.

Each subject was exposed to a series of 20 stimuli. For each stimulus the task was to evaluate it on a set of bipolar rating scales. Prior to viewing each stimulus, subjects were presented with slides showing the scales to be used in evaluating the ads (orienting task). After viewing each stimulus, subjects were again presented with the ratings scales and evaluated the stimulus. Thus, the basic procedure consisted of exposure to the rating scales (3 seconds), exposure to the stimulus (4 seconds), and then exposure to the scales again while performing the ratings (10 seconds). This cycle was repeated for 20 experimental and 8 extraneous slides. The brief exposure and evaluation periods were designed to limit rehearsal and nondirected processing (e.g., spontaneous semantic processing in sensory condition).

To enable subjects to become acquainted with the rating task, the first four stimuli served as practice for each group and were not included in the primary analyses. These stimuli were similar to the remaining pool of stimuli. To reduce the effects of recency on the dependent measures, the last four stimuli were also not included in the analysis. Also, the experimental stimuli were rotated to guard against order effects. Thus, in each treatment subjects were exposed to and rated 28 stimuli, 20 of which were included in the subsequent statistical analyses.

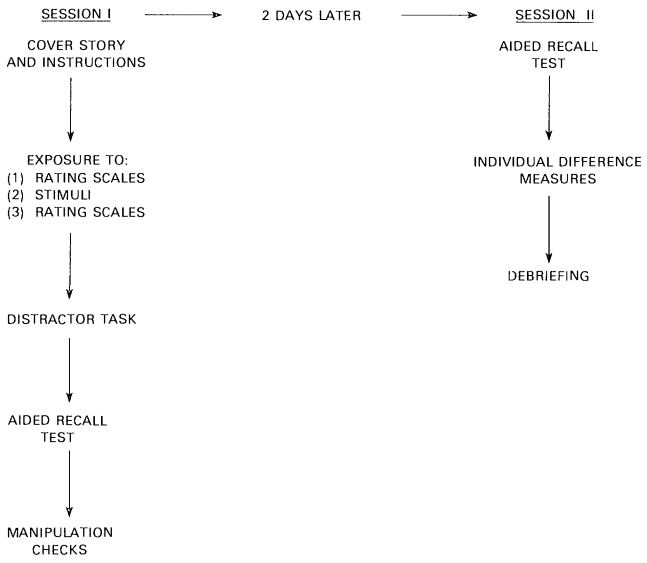
Following exposure and rating of the stimuli, subjects were given an arithmetic distractor task that lasted 30 seconds. This distractor also served to reduce the effects

on recall of the most recently exposed stimuli. Following the distractor task, subjects were administered an unexpected recall test. Subjects were allotted 3 minutes to recall as many brand or company names as possible, given each product category. The final task was a series of questions designed to determine the approach used by subjects when processing the stimuli. The first session of the experiment lasted approximately 30 minutes.

Subjects participated in a second laboratory session two days after their initial exposure to the stimuli. This session provided the opportunity to study long-term retention as well as to collect additional descriptive information. During this session, subjects were given a recall test identical to the initial one, except that 4 minutes were allocated for completion. After completion of the recall task, a questionnaire was administered to collect information dealing with individual differences in imagery ability. A summary of the data collection procedures is provided in Figure A.

FIGURE A

OVERVIEW OF EXPERIMENTAL PROCEDURES



Experimental Manipulations

As previously noted, four independent variables were manipulated, each at two levels. In this section the specific procedures used to achieve these manipulations are described.

Type of Stimulus. In the pictorial condition, brand names (e.g., Gateway Fence Company) were accompanied by interactive pictures that directly portrayed the brand name. The verbal condition was represented by stimuli that stated only brand names in verbal fashion with no accompanying pictures. Thus, in the strictest sense, there is no pure comparison of pictures-only to words-only available in this study. This approach was taken because it was felt to be more consistent with the natural information processing environment of consumers. Virtually all printed consumer information involves either picture–word combinations or verbal material only.

Depth of Processing. The depth of processing manipulation was based on the levels-of-processing framework (Craik and Lockhart 1972). Half of the subjects received a manipulation designed to achieve a sensory level of processing, while the other half received a semantic-level manipulation. This manipulation was incorporated into two phases of the procedures. First, during the cover story and instructions, subjects were directed to process at a sensory or semantic level. In evaluating ads, subjects were told to focus on the appearance or informational content of each ad. Each set of instructions contained an equivalent number of references to either the appearance or informational features of the ads to be presented. Second, subjects were directed to process at sensory or semantic levels based upon the adjectives employed in the rating scales used to evaluate ads. Appearance-related adjectives (e.g., shape, curvature) were used to direct sensory processing while semantic adjectives (e.g., strong, good) were used to direct semantic processing. By exposing subjects to each scale set prior to viewing the ad, an "orienting" task was provided that was similar to the procedure for directing depth of processing employed by Craik and Tulving (1975).

Checks on the sensory–semantic manipulation involved two scales containing Likert-type items. A 12-item scale was used to assess the extent to which processing focused on the semantic content of stimuli. A five-item scale assessed the extent to which processing focused on the appearance of the stimuli.

Level of Meaning. All the ads were constructed so that a relational association between brand name and type of product or service was achieved. However, it was necessary to manipulate the presence or absence of additional cues in the ads. Pictures (and their word-only counterparts) were manipulated such that meaning about an attribute of the product was or was not conveyed. For pictures with meaning—such as Superman Fence Company, for example—the ad was portrayed with a likeness of the Superman comic book character. Both the picture and word-only stimuli were designed to elicit the redundant cue of "strong fences." The low information version was manipulated by using pictures and word-only stimuli that reflected a relational organization but did not convey attribute-related information—e.g., Gateway Fence Company.

The validity of this manipulation was established during the development and pretests of the stimuli. Additional checks for the ultimate subject pool were available in the rating scale evaluations of high-meaning ads, which included an adjective pair that corresponded to the product attribute conveyed in the ad. Also, the 12-item scale on processing of semantic content served this role.

Sensory Distinctiveness. Color was used to achieve high sensory distinctiveness of ads within a treatment. Low sensory distinctiveness was represented by the use of black and white. In high-distinctiveness picture cells, three different colors (two integrated into the picture and a yellow background) were used. Stimulus differentiation was achieved by using five different sets of two colors, resulting in four pictures of each set.

The use of different sets of colors provided a contrast between the stimuli that was not present when all stimuli were presented in black and white. The manner in which the colors were used also contributed to the distinctiveness of each picture. For Arrow Pest Control, for example, a pest was depicted in red with a green arrow piercing the pest's body. For differentiated words, each label was constructed in two colors, one color for the brand name and a different color for the product class. Colors were matched between the corresponding stimuli with pictures and words-only.

A check on the effectiveness of color was included in the measures taken at the end of the first session. A Likert-type scale was used that assessed the extent to which the ads within each cell appeared different from each other.

Covariates

Since pictures have strong imagery-evoking capabilities and imaginal processing is subject to individual differences in preferences and abilities, measures of several covariates were obtained at the end of the second session. These variables included imagery vividness, visual imagery control, and processing style. To measure imagery vividness, the 16-item Vividness of Visual Imagery Questionnaire (Marks 1973) was employed. Richardson's (1969) revision of the 12-item Gordon Test of Visual Imagery Control also was employed in the present study. Finally, a 15-item measure of processing style recently developed by Richardson (1977) was used as an individual difference factor. White, Sheehan, and Ashton (1977) recently reviewed the instruments that were administered and concluded they possess desirable reliability and validity properties.

Dependent Variables

The major dependent variable is the retention in memory of the ads to which the subject was exposed. Memory performance was assessed through an aided recall test. This test consisted of a listing of the product categories for each of the exposed stimuli. Subjects were asked to recall and associate the appropriate brand or company name with each product category. Answers were considered correct if associated with the correct product class and if spelled with no more than a two-letter error. To assess the stability of results, both an immediate (Session I) and a delayed (Session II) administration of recall occurred. In both cases the specific measure of memory performance was the number of ads (out of 20) correctly recalled.

Analyses

Two forms of statistical analysis were applied to the findings. First, several between-group comparisons were made to check on the validity of the manipulations of each factor. Second, analysis of covariance was used to assess the effects of manipulated factors and covariates on recall, thus testing the stated hypotheses. Accompanying this analysis were homogeneity of variance tests.

FINDINGS

Manipulation Checks

To test whether the level-of-meaning manipulation was successful with the experimental subjects, *t*-tests comparing subjects in high- versus low-meaning cells were conducted on the target cue (e.g., durability of Rhino Tires) embedded within the semantic rating scales. Twelve of the 20 stimuli differed statistically at $p < 0.05$ in the predicted direction, and 14 of 20 differed at $p < 0.10$. Thus meaning variation between appropriate stimuli carried over substantially to the experimental subjects.

The effectiveness of the use of color in achieving the sensory distinctiveness manipulation was assessed using the five-item stimulus differentiation scale ($\alpha = 0.59$). Subjects instructed to process at the sensory level are the key to the success of the manipulation. Given their orientation to the appearance of stimuli, differences between sensory-directed subjects who viewed color stimuli and those viewing black-and-white stimuli should occur. Furthermore, differences should be present between these groups in the perceived colorfulness of stimuli.

While differences between the groups on the summed score were in the proper direction, they were not significantly different ($t = 0.48$, $p > 0.05$). However, on the specific attribute of color, sensory-directed subjects viewing ads in color did rate these stimuli as significantly more colorful than subjects viewing black-and-white ads ($t = 3.93$, $p < 0.01$). Thus it is evident that color had a significant impact on the appearance of stimuli, although its effectiveness in further distinguishing between stimuli within a series is questionable.

The assessment of the depth-of-processing manipulation was initially conducted without direct comparisons between sensory-instructed and semantic-instructed subjects. Instead, each group was separately analyzed in terms of the type of processing that was going on within it. If a semantic level of processing was achieved in the group instructed to do so, then differences in the perceived semantic content of high- versus low-meaning stimuli should occur between semantic-only subjects in the two meaning cells.

Using the 12-item scale to assess semantic processing ($\alpha = 0.84$), subjects in the semantic group receiving high

TABLE 1

MEAN IMMEDIATE AND DELAYED RECALL SCORES FOR EXPERIMENTAL GROUPS

Manipulated factors		Sensory processing: High information[a]	Sensory processing: Low information[b]	Semantic processing: High information[a]	Semantic processing: Low information[b]	Overall mean
Pictures and words	Color[c]	7.2[e] 6.8 n = 19 1	7.4 7.0 n = 16 2	7.7 7.1 n = 17 3	6.7 6.3 n = 20 4	7.2 (6.8)
	Black and white[d]	4.6 5.0 n = 18 5	7.6 6.5 n = 16 6	8.6 8.1 n = 17 7	10.0 8.9 n = 16 8	7.6 (7.1)
Words only	Color[c]	1.1 1.1 n = 16 9	1.3 1.1 n = 16 10	7.6 5.9 n = 16 11	6.6 5.3 n = 16 12	4.2 (3.4)
	Black and white[d]	1.8 1.8 n = 17 13	1.5 1.2 n = 18 14	8.9 7.4 n = 16 15	7.2 5.4 n = 17 16	4.8 (3.9)
Overall mean		4.1 3.9		7.9 6.8		

[a] Overall means for high information content are 6.0 for immediate recall and 5.4 for delayed recall.
[b] Overall means for low information content are 6.0 for immediate recall and 5.2 for delayed recall.
[c] Overall means for color stimuli are 5.8 for immediate recall and 5.2 for delayed recall.
[d] Overall means for black and white stimuli are 6.2 for immediate recall and 5.5 for delayed recall.
[e] The four entries in each cell are (1) immediate recall scores, (2) delayed recall scores, (3) sample size, and (4) cell number, respectively.

information content stimuli indicated the stimuli were more meaningful than those in the low information content treatment group ($t = 4.24, p < 0.01$). This is consistent with expectations for a deeper level of processing. The achievement of a sensory level of processing is indicated in analogous fashion, by comparing differences in the perceived appearance of color versus black-and-white ads by subjects instructed to process at a sensory level. As indicated above, sensory-instructed subjects who saw ads in color rated them as significantly more colorful than did those who saw ads in black-and-white.

While these findings help to establish that semantic processing occurred in the subjects instructed to do so and that sensory processing occurred in the group so instructed, they do not directly establish that differences in depth of processing occurred between the sensory and semantic groups. Sensory-instructed subjects detecting sensory differences between appropriate stimuli may still have processed at the semantic level, and vice versa. Consequently, further analyses of the sensory–semantic manipulation were performed.

These additional analyses focused on the amount of cognitive activity that appeared to be present in each group. If the manipulation were successful, semantic-instructed subjects should exhibit greater amounts and differing types of cognitive activity than sensory-oriented subjects. The nature of the actual recall data was examined to assess differences in cognitive activity. Specifically, the errors made by subjects in trying to recall brand–product-class associations were analyzed in terms of their total frequency and semantic nature. Total incorrect recall attempts (blank responses were not counted) were computed for each subject. The number of these incorrect responses that represented a semantic associate of the correct brand name (e.g., World-Wide instead of Globe Travel Service) were coded without knowledge of the experimental cell to which a subject was assigned. (Acoustical intrusions—e.g., Pocket instead of Rocket Messenger Service—would be an example of a nonsemantic error.) Thus we have measures of the total amount of cognitive effort—and the portion of it that is of a semantic nature—that was occurring at retrieval during the immediate recall test.

The results generally confirm clear differences between semantic- and sensory-oriented subjects. Total incorrect responses averaged 2.4 and 1.8 for semantic- and sensory-oriented subjects, respectively. For the semantic subjects, an average of 0.5 (21 percent) incorrect responses were of a semantic nature. For sensory subjects, the corresponding value was only 0.2 (11 percent). In both cases, semantic-instructed subjects scored significantly higher ($p < 0.025$) than sensory-oriented subjects.

General Findings on Recall

Mean immediate and delayed recall scores for each experimental cell are provided in Table 1. Overall, subjects

TABLE 2

ANALYSIS OF COVARIANCE FOR IMMEDIATE AND DELAYED RECALL TESTS

Source of variation	Immediate recall F	Immediate recall p	Delayed recall F	Delayed recall p
Covariates				
Vividness	4.7	.031	2.4	.121
Control	9.3	.003	7.5	.007
Style	.8	.372	1.5	.225
Main effects				
Level of processing (A)	64.2	.000	41.0	.000
Pictures versus words (B)	44.0	.000	59.1	.000
Information content (C)	.1	.756	.1	.798
Color (D)	1.6	.205	1.4	.241
Two-way interactions				
A × B	26.0	.000	16.1	.000
A × C	1.7	.196	1.1	.300
A × D	4.4	.037	4.1	.044
B × C	3.2	.076	1.8	.179
B × D	.1	.776	.1	.777
C × D	1.7	.190	.2	.629
Three-way interactions				
A × B × C	.1	.757	.0	.961
A × B × D	2.8	.098	2.5	.117
A × C × D	.0	.869	.0	.919
B × C × D	2.8	.098	1.9	.166
Four-way interactions				
A × B × C × D	.0	.870	.2	.691

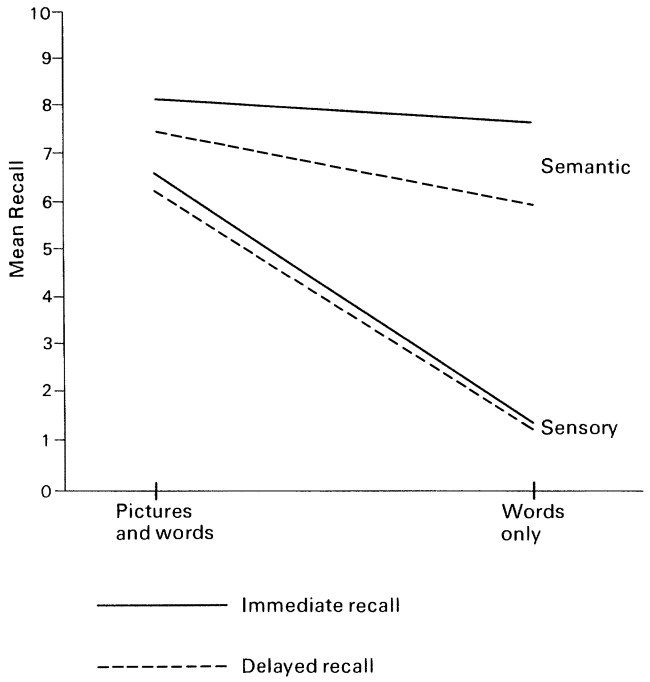
correctly recalled an average of 30 percent of the stimulus pairs in the immediate task.[2] Correct recall in the delayed task decayed to approximately 27 percent of the stimuli. Immediate recall across treatment groups ranged from 6 to 50 percent; in the delayed measure, the range was 6 to 44 percent. On the whole, memory decay between recall measures was low.

Analysis of Covariance Results

Table 2 summarizes the analysis of covariance results for both the immediate and the delayed recall tests. Appropriate tests were conducted for the assumption of within-factor homogeneity among the regression coefficients used in the adjustment of treatment means for individual differences. The decomposed F ratios for the covariate interaction effects were not statistically significant ($p > 0.05$), thus satisfying the assumption. Additional tests also confirmed the homogeneity of variance assumption with respect to recall measures.

FIGURE B

INTERACTION EFFECTS: TYPE OF STIMULUS × DEPTH OF PROCESSING



The analysis of covariance results provide the necessary information to test the hypotheses of this study. Hypothesis 1 states that ads with pictures are recalled better than word-only ads when each is processed at a sensory level, but not when each is processed at a semantic level. Of further interest is whether this pattern differs for brand names with high versus low meaning (presence versus absence of redundant cues). The general form of Hypothesis 1 would be confirmed by a significant two-way interaction effect of depth of processing and type of stimulus. Variations in this effect for high and low meaning brands would be indicated by a significant three-way interaction involving the level-of-meaning factor.

In Table 2, a significant two-way interaction term involving type of stimulus and depth of processing is present for both immediate and delayed recall scores. Furthermore, the nature of this interaction conforms precisely with the pattern predicted in Hypothesis 1 (see Figure B for a graphic representation). Under immediate recall, pictures outperformed words under sensory processing, while under semantic processing there is only a slight difference. For delayed recall, a large difference still exists under sensory processing, while under semantic processing there is a greater decline in recall for words as compared to pictures.

To test the statistical significance of these differences, planned comparison tests were conducted. For immediate recall under sensory processing, pictures were superior to

[2] While this level of recall might seem low, it should be considered that subjects viewed a large number of stimuli, each for a short, controlled period (4 seconds), within a short total period of time (8 minutes), and under an incidental learning paradigm in which they were unaware that recall would be required.

words ($p < 0.001$), while under semantic processing there was no difference ($p > 0.36$). For delayed recall, the picture superiority effect is strongest under sensory processing ($p < 0.001$) but does retain significance ($p < 0.02$) under semantic processing. Thus the precise pattern of results predicted in Hypothesis 1 is clearly present for immediate recall. However, the delayed recall results suggest that memory for words-only decays more rapidly. In neither the immediate nor the delayed recall results does the variation in the meaning content of the stimuli alter these findings. The three-way interaction relevant to the impact of incidental redundant cues ($A \times B \times C$) is not significant under immediate or delayed recall.

Hypothesis 2 deals with the effects of pictorial stimuli that are more distinctive in terms of their sensory features. Specifically, it predicts that more distinctive pictorial stimuli will be remembered over corresponding words-only stimuli under sensory processing but not under semantic processing. Support for this hypothesis would be evidenced by a significant three-way interaction term involving type of stimulus, depth of processing, and color ($A \times B \times D$).

While this interaction term is significant for immediate recall ($p < 0.10$), an examination of cell values in Table 1 suggests that Hypothesis 2 is not confirmed. Rather than enhancing the recall of pictures under sensory processing, color appears to have a detrimental effect on the recall of words under all conditions, and on the recall of pictures under semantic processing. Given the tenuous success of color as a sensory discriminator (as revealed by the manipulation checks), it is uncertain that a valid test of Hypothesis 2 has been performed.

DISCUSSION

This research contributes to the growing body of literature that addresses the conditions for a picture-superiority effect and the role of pictures as an external organizing mechanism. The effects of organizing information to facilitate its encoding in human memory have been the subject of many past empirical investigations. Early studies focused on verbal-based organization (e.g., Bousefield 1951, 1953; Jenkins and Russell 1952; Jenkins, Mink, and Russell 1958). More recent studies have focused on organization through visual factors. Frost (1972) found that categorical clustering can result from the physical appearance of the stimuli. Picture recognition was related to the angular orientation of the stimuli. Bransford and Johnson (1972) showed how a picture with a meaningful context enabled organization and recall of an ambiguous and difficult-to-comprehend passage.

The results of the present research offer some evidence that qualifies the effects of visual and, especially, verbal organization on memory. The effectiveness of an organized, verbally based stimulus occurs when its semantic properties are encoded. Furthermore, its effectiveness equates to that of visually organized stimuli when both are processed in semantic fashion.

Based on the results of this study, stimuli that promote redundant cues do not appear to alter the above findings. The encoding of semantic content restricted to an organized verbal stimulus appears sufficient to obtain verbal–visual equivalence under semantic processing. However, this conclusion must be regarded as tentative. Its validity is a function of the success of the high-meaning–low-meaning manipulation as an operationalization of the presence–absence of incidental cues. We cannot be certain that only high-meaning ads promoted incidental cues. Pretests and manipulation checks showed that the high-meaning ads promoted additional information *of the type they were designed to promote* to a greater extent than low-meaning ads. However, it is possible that low-meaning ads were promoting additional cues of a type that were not examined in the pretests and manipulation checks. If so, incidental cues were available in both sets of ads and a valid test of this issue was not performed.

The effects of visually organized stimuli suggest several important conclusions. First, consistent with a key hypothesis of the study, pictorial ads were recalled to a much greater extent than verbal-only ads when encoding focused on the sensory features of stimuli. Furthermore, the absolute effectiveness of visual organization is substantially retained for sensory versus semantic processing. Finally, a picture-superiority effect becomes evident under semantic processing when memory is measured over time. In the delayed recall measure, the initial equivalence of pictorial and verbal-only ads was lost, as verbal-only ads showed a greater decay. These results suggest that an interactive picture provides a means of modifying material through its external organization, and in a sense enables the subject to immediately "chunk" the material at encoding. The result is a stronger memory trace that aids retrieval over a longer period of time.

IMPLICATIONS

Important implications regarding the use of visual and verbal material in consumer information stimuli emerge from this study. A verbally based message appears to be most appropriately used in conditions where the audience is motivated and capable of processing the semantic content of the message. High-involvement audiences and media that allow the consumer to control the pace of exposure (e.g., print ads) represent such conditions. However, given the more rapid decay in memory of verbal material, more frequent exposure appears to be necessary for a predominantly or exclusively verbal message.

Visually oriented messages seem particularly appropriate under conditions where audiences are less motivated or capable of semantic processing. Low-involvement consumers and media-paced exposure time (e.g., TV ads) represent these conditions. Visual ads seem to require less frequency of exposure than that necessary for verbal ads to achieve the same effect on long-term memory.

While verbal ads achieve the same level of memorability as visual ads under certain conditions, the weight of the

evidence still points to visual ads as a preferred approach. Visual ads were superior to verbal ads in certain conditions in this study, and in no conditions were they inferior. However, cost-benefit analyses were not performed, and the effects examined in the study were restricted to memory. Obviously, the effectiveness of many messages must be assessed beyond their memorability. Persuasiveness with respect to belief and attitude formation is one important criterion, and research that examines picture-word effects in the attitudinal domain might yield different conclusions.

A final comment is in order regarding the role and effect of color in this study. Color was incorporated into the ads in half of the treatments in an attempt to add distinctiveness to each ad within the series of 20 ads contained in a treatment. It is questionable whether color successfully performed this role, rendering the test of Hypothesis 2 tenuous at best. However, color did seem to perform the simple role of making each series of ads in which it was used more colorful than the series of ads in black-and-white cells. In this regard its effects on memory were rather surprising, in that it was more of a detriment to recall than a facilitator, especially under semantic conditions. When semantic processing occurs, color may interfere with or detract from elaborative processing. With less processing to interfere with under sensory processing, this detrimental effect may be reduced. Research that replicates this effect of color on memory would be desirable.

[*Received May 1982. Revised February 1984.*]

REFERENCES

Bousefield, W. A. (1951), "Frequency and Availability Measures in Language Behavior," paper presented at Annual Meeting, American Psychological Association, Chicago.

——— (1953), "The Occurrence of Clustering in the Recall of Randomly Arranged Associates," *Journal of General Psychology,* 49, 229–240.

Bower, Gordon H. (1970), "Imagery as a Relational Organizer in Associative Learning," *Journal of Verbal Learning and Verbal Behavior,* 9 (5), 529–533.

——— (1972), *Cognition in Learning Memory,* New York: John Wiley.

———, Martin B. Karlin, and Alvin Dueck (1975), "Comprehension and Memory for Pictures," *Memory and Cognition,* 3 (2), 216–220.

Bransford, J. D. and M. K. Johnson (1972), "Contextual Prerequisites for Understanding: Some Investigations of Comprehension and Recall," *Journal of Verbal Learning and Verbal Behavior,* 11 (6), 717–726.

Craik, Fergus I. M. and Robert S. Lockhart (1972), "Levels of Processing: A Framework for Memory Research," *Journal of Verbal Learning and Verbal Behavior,* 11 (6), 671–684.

——— and Endel Tulving (1975), "Depth of Processing and Retention of Words in Episodic Memory," *Journal of Experimental Psychology,* General, 104 (3), 268–294.

Edell, Julie A. and Richard Staelin (1983), "The Information Processing of Pictures in Print Advertisements," *Journal of Consumer Research,* 10 (June), 45–61.

Frost, Nancy (1972), "Encoding and Retrieval in Visual Memory Tasks," *Journal of Experimental Psychology,* 95 (2), 317–326.

Holbrook, Morris B. and William L. Moore (1981), "Feature Interactions in Consumer Judgments of Verbal Versus Pictorial Presentations," *Journal of Consumer Research,* 8 (June), 103–113.

Jacoby, Larry L. and Fergus I. M. Craik (1979), "Effects of Elaboration of Processing at Encoding and Retrieval: Trace Distinctiveness and Recovery of Initial Context," in *Levels of Processing in Human Memory,* eds. Laird S. Cermak and Fergus I. M. Craik, Hillsdale, NJ: Lawrence Erlbaum.

Jenkins, J. J., and W. A. Russell (1952), "Associate Clustering During Recall," *Journal of Abnormal and Social Psychology,* 47, 818–821.

———, W. D. Mink, and W. A. Russell (1958), "Associative Clustering as a Function of Verbal Association Strength," *Psychological Reports,* 4, 127–136.

Kieras, David (1978), "Beyond Pictures and Words: Alternative Information-Processing Models for Imagery Effects in Verbal Memory," *Psychological Bulletin,* 85 (3), 532–554.

Kisielius, Jolita (1982), "The Role of Memory in Understanding Advertising Media Effectiveness: The Effect of Imagery on Consumer Decision Making," in *Advances in Consumer Research,* Vol. 9, ed. Andrew Mitchell, Ann Arbor, MI: Association for Consumer Research, 183–186.

——— and Deborah Roedder (1983), "The Effects of Imagery on Attitude-Behavior Consistency," in *Advances in Consumer Research,* Vol. 10, eds. Richard Bogozzi and Alice M. Tybout, Ann Arbor, MI: Association for Consumer Research, 72–74.

Lippman, Marcia Z. and Morris W. Shanahan (1973), "Pictorial Facilitation of Paired-Associate Learning: Implications for Vocabulary Training," *Journal of Educational Psychology,* 64 (2), 216–222.

Lutz, Kathy A. and Richard J. Lutz (1977), "Effects of Interactive Imagery on Learning: Application to Advertising," *Journal of Applied Psychology,* 62 (4), 493–498.

——— and Richard J. Lutz (1978), "Imagery-Eliciting Strategies: Review and Implications of Research," Vol. 5, in *Advances in Consumer Research,* ed. H. Keith Hunt, Ann Arbor, MI: Association for Consumer Research, 611–620.

Marks, David E. (1973), "Visual Imagery Differences in the Recall of Pictures," *British Journal of Psychology,* 64 (1), 17–24.

Morris, P. E. and R. Stevens (1974), "Linking Images and Free Recall," *Journal of Verbal Learning and Verbal Behavior,* 13 (3), 10–15.

Nelson, Douglas L. (1979), "Remembering Picture and Words: Appearance, Significance, and Name," in *Levels of Processing in Human Memory,* eds. L. Cermak and F. I. M. Craik, Hillsdale, NJ: Lawrence Erlbaum.

———, Valerie S. Reed, and John R. Walling (1976), "The Pictorial Superiority Effect," *Journal of Experimental Psychology: Human Learning and Memory,* 2 (5), 523–528.

———, Valerie S. Reed, and Cathy L. McEvoy (1977), "Encoding Strategy and Sensory and Semantic Interference," *Memory and Cognition,* 5 (4), 462–467.

Paivio, Allan (1969), "Mental Imagery in Associative Learning and Memory," *Psychological Review,* 76 (3), 241–263.

——— (1971), *Imagery and Verbal Processes,* New York: Holt, Rinehart & Winston.

——— and Dennis Foth (1970), "Imaginal and Verbal Mediators and Noun Concreteness in Paired-Associate Learning: The Elusive Interaction," *Journal of Verbal Learning and Behavior,* 9 (4), 384–390.

Peterson, M. J. and A. Murray (1973), "Enhancement of Items and Associations," *Journal of Experimental Psychology,* 101 (1), 82–89.

——— and S. H. McGee (1974), "Effects of Imagery Instructions, Imagery Ratings, and Number of Dictionary Meanings Upon Recognition and Recall," *Journal of Experimental Psychology,* 102 (6), 1007–1014.

Richardson, Alan (1969), *Mental Imagery,* London: Routledge and Kegan Paul.

——— (1977), "Verbalizer-Visualizer: A Cognitive Style Dimension," *Journal of Mental Imagery,* 1 (1), 109–126.

Ritchey, G. H. and C. R. Beal (1980), "Image Detail and Recall: Evidence for Within-Item Elaboration," *Journal of Experimental Psychology: Human Learning and Memory,* 6 (1), 66–76.

Robbins, Donald, James F. Bray, James R. Irwin, and Philip W. Wise (1974), "Memorial Strategy and Imagery: An Interaction Between Instructions and Rated Imagery," *Journal of Experimental Psychology,* 102 (4), 706–709.

White, K., P. W. Sheehan, and R. Ashton (1977), "Imagery Assessment: A Survey of Self-Report Measures," *Journal of Mental Imagery,* 1 (1), 145–170.

Wright, Peter and Peter D. Rip (1980), "Product Class Advertising Effects on First Time Buyer's Decision Strategies," *Journal of Consumer Research,* 7 (September), 176–188.

Yuille, John C. (1973), "A Detailed Examination of Mediation in PA Learning," *Memory and Cognition,* 1 (3), 333–342.

References

The Information Processing of Pictures in Print Advertisements
Julie A. Edell; Richard Staelin
The Journal of Consumer Research, Vol. 10, No. 1. (Jun., 1983), pp. 45-61.
Stable URL:
http://links.jstor.org/sici?sici=0093-5301%28198306%2910%3A1%3C45%3ATIPOPI%3E2.0.CO%3B2-P

Feature Interactions in Consumer Judgments of Verbal versus Pictorial Presentations
Morris B. Holbrook; William L. Moore
The Journal of Consumer Research, Vol. 8, No. 1. (Jun., 1981), pp. 103-113.
Stable URL:
http://links.jstor.org/sici?sici=0093-5301%28198106%298%3A1%3C103%3AFIICJO%3E2.0.CO%3B2-A

Product Class Advertising Effects on First-Time Buyers' Decision Strategies
Peter Wright; Peter D. Rip
The Journal of Consumer Research, Vol. 7, No. 2. (Sep., 1980), pp. 176-188.
Stable URL:
http://links.jstor.org/sici?sici=0093-5301%28198009%297%3A2%3C176%3APCAEOF%3E2.0.CO%3B2-G