Measurement of Individual Differences in Visual Versus Verbal Information Processing

TERRY L. CHILDERS
MICHAEL J. HOUSTON
SUSAN E. HECKLER*

The examination of individual differences in consumer information processing is an emerging area of research within both marketing and consumer behavior. In this article, we report on two studies that focus on ability versus preference for imaginal or visual processing. The first study assesses the psychometric properties of frequently used measures of imaginal processing ability and preference; the study's results were somewhat supportive of the two ability measures but not supportive of the preference measure. The second study proposes and tests a new measure of processing preference—the Style of Processing (SOP) scale—which exhibits internal consistency as well as discriminant and criterion validity.

The ways in which individuals differ in the rate, extent, style, and quality of their information processing is an important and emerging area of investigation in marketing and consumer behavior. Different consumers, faced with a variety of situations, have been shown to have different processing skills, goals, and prior experience (Bettman 1979; Bettman and Park 1980; Capon and Burke 1980; Capon and Davis 1984; Jacoby, Chestnut, and Fisher 1978; Moore and Lehmann 1980; Park 1976). Studies have found that individuals differ significantly in their acquisition of information, the strategies they employ during acquisition, and their utilization of acquired information when forming judgments. For example, Henry (1980) found that individual integrative complexity was related to information processing accuracy. He found that the accuracy of pairwise similarity judgments for 11 brands of laundry detergent over a range of two to five attributes was affected more by individual abilities than by the increase in complexity of purchase information. This latter finding is important since it relates to the issue of individual predispositions for processing information versus a task-driven processing orientation.

This issue of processing orientations was further developed in a study conducted by Capon and Burke (1980). These authors explored information acquisition strategies and related them to individual differences in socioeconomic status (SES). One of their findings was that mid/high SES subjects were more accomplished information processors than low SES subjects. Mid/high SES subjects sought more information, utilized more objective testing data, and were more complete in their evaluation of each brand alternative. The importance that Capon and Burke attributed to individual differences contrasts with a study which found that a task-related factor (presentation format) was more influential in determining processing strategy (Bettman and Kakkar 1977). However, in their review of Bettman and Kakkar, Capon and Burke noted that a significant portion of the subjects in the earlier study employed a preferred strategy (brand versus attribute processing) that was contrary to the information presentation format (1980, p. 315). The source for such a predisposition for processing information may stem from at least two individual characteristics.

First, individual predispositions may stem from differential *abilities* to process information (Capon

*Terry L. Childers is Assistant Professor of Marketing, University of Minnesota, Minneapolis, MN 55455. Michael J. Houston is McManus-Bascom Professor in Marketing, University of Wisconsin, Madison, WI 53706. Susan E. Heckler is Assistant Professor of Marketing, College of St. Thomas, St. Paul, MN 55105. The authors would like to thank Ruth A. Smith and George John for their assistance in conducting this research, and acknowledge the suggestions of the anonymous referees. Partial funding for this research was obtained from the School of Management, University of Minnesota.

© JOURNAL OF CONSUMER RESEARCH • Vol 12 • September 1985

and Burke 1980; Capon and Davis 1984). In the Capon and Davis study, performance on information acquisition tasks was related to basic abilities for systematic combination and isolation of variables derived from formal operations theory (Inhelder and Piaget 1958). This processing ability contrasts with a *preference* for utilizing a particular processing strategy. Richardson (1978) persuasively argues that coding efficiency (ability) and coding preference are relatively independent dimensions along which individuals may vary. He contends that the crucial factor in understanding how individuals process information is their tendency to utilize one strategy over a set of alternatives. He found that judgments of presentation modality (verbal versus visual information) and memory recall were significantly related to processing preference rather than processing ability. Bettman and Kakkar's (1977) results do not differentiate an ability versus a preference processing strategy; however, their conceptualization recognizes the potential for the use of preferred rules and strategies in the acquisition of information.

From this brief review of the literature one may conclude that there are two facets of individual information processing. One facet focuses on a predisposition to invoke a processing strategy based on one's cognitive ability. But because consumers possess many different processing skills, a second dimension or facet of information processing must also be considered. This facet relates more to a style of processing and is evoked as the result of an individual's preferences—preferences that often lead the consumer to select one strategy from the battery of alternatives available. Ability alone appears inadequate to explain the variance among groups that may converge on a single processing strategy (Bettman and Kakkar 1977).

Issues related to the identification and measurement of individual differences in information processing are important to consumer behavior research for several reasons. From a communication perspective, understanding the interaction between information presentation format and individual predisposition for information presentation should lead to a more effective consumer information system (Capon and Lutz 1979). Assessing skill levels and the propensity for utilizing various forms of consumption information (for example, visual versus verbal or statistical versus abstract) could lead to either communications designed to improve acquisition skills (coding efficiency) or a revision in the manner in which information is presented (coding preference).

Additionally, incorporation of individual difference research is important to the pursuit of theoretical questions relating to consumer information processing. One important question concerns the relationship between encoding ability and preference and the nature of the storage system in consumer memory (Richardson 1978). Another question concerns the relationship between imaginal processing skills and strategies arising from formal operations theory (Capon and Davis 1984), and a final question concerns the occurrence of brand versus attribute processing of purchase information (Bettman and Kakkar 1977; Biehal and Chakravarti 1982; Capon and Burke 1980). From a methodological perspective, controlling for individual differences within an experimental framework can improve statistical power (Sawyer and Ball 1981). By utilizing and exploring individual differences in information processing research, we may broaden and strengthen our understanding of how consumers acquire and utilize purchase-related information.

The research on individual differences that has been reported in the consumer behavior literature has primarily incorporated measures of consumers' verbal processing efforts (Capon and Davis 1984). The present research expands this examination to include visual information processing—an emerging area in consumer behavior (see Childers and Houston 1984; Edell and Staelin 1983; Holbrook and Moore 1981; Kisielius and Sternthal 1984). This line of research has consistently found that visual processing—particularly mental imagery—is a strong facilitator of the type of learning that characterizes consumer information acquisition (Alesandrini 1983; Lutz and Lutz 1978; Paivio 1969). This article will (1) report on a psychometric assessment of commonly used indicators of visual information processing ability and preference, and (2) propose and develop a new measure of processing preference—the Style of Processing (SOP) scale—designed to overcome deficiencies identified in the scale currently utilized to measure that trait.

INDIVIDUAL DIFFERENCES IN IMAGINAL INFORMATION PROCESSING

> Perhaps the most stubborn noncontroversial observation about the mental image is the enormous variation in quality reported by different individuals (Marks 1977, p. 279).

In a critical review, Ernest (1977) noted that individual differences in imagery can have a significant impact on an array of cognitive functions including learning, memory, perception, and problem solving. Research on individual differences in imaginal processing has identified several facets of processing that can be categorized as:

- Imagery vividness—the clarity of the mental image an individual evokes.
- Imagery control—the individual's ability to self-generate a mental image or to perform certain manipulations, such as mental rotation.
- Imagery style—the individual's willingness to habitually engage in imaginally versus verbally oriented processing.

While these facets of imaginal processing have, as noted, been the subject of a number of studies in cognitive psychology (for extensive reviews see Ernest 1977; Marks 1977), a number of consumer behavior studies have also considered individual differences in imaginal processing. For example, Rossiter and Percy (1978) found that a preference for engaging in imaginal processing, as assessed by the Visualizer-Verbalizer Questionnaire (VVQ scale; Richardson 1977), was strongly related to positive affective reactions toward visually oriented print advertisements. In a study of the memory for product hazard information, the vividness of stored information as reported by subjects was found to differ substantially across product categories (Rethans and Hastak 1980). In a related study, Smith, Houston, and Childers (1984) reported that subjects identified as schematics (as opposed to aschematics) engaged in more imaginal processing and generated more vivid images of the base and idiosyncratic actions contained in their scripts. Also, Childers and Houston (1984) found that imagery vividness and control were significantly related to immediate recall of print advertisements, while under delayed recall, only control was statistically significant. Additionally, style of processing as measured by the VVQ was found not to be related to either immediate or delayed recall.

Although these studies have investigated the role of individual imaginal differences in several judgmental and memory-related tasks, a comprehensive evaluation of the psychometric properties of the self-report measures commonly used to assess these facets has not been undertaken. While White, Sheehan, and Ashton (1977) reviewed the literature containing assessments of self-report measures of imagery ability, their review preceded the introduction of the VVQ scale as a measure of processing style. However, the White et al. review does provide norms for several of the measures used in our study; comparisons will be given where applicable. The following sections report on two studies conducted to evaluate several measures of imaginal information processing, and summarize results for a new measure of style of processing—the SOP scale.

METHOD

Measures

The measures of individual imagery ability and preference for imaginal processing evaluated in this study are among the most widely used and cited in the literature (Ernest 1977; White et al. 1977). A brief description of each instrument is given below:

- Imagery Vividness—The Vividness of Visual Imagery Questionnaire (VVIQ) was developed by Marks (1973) and is an enhancement of Bett's Questionnaire on Mental Imagery (see Sheehan 1967). This is a 16-item scale with five response alternatives.
- Imagery Control—The Gordon test of Visual Imagery Control (VIC) was used to assess this facet of imaginal processing. Richardson (1969) revised the instrument to include 12 items with a true/false or unsure response format, which is the version employed in this study.
- Imagery Style—The Verbalizer Visualizer Questionnaire (VVQ) developed by Richardson (1977) is also used in the present study. The scale consists of 15 items and utilizes a true/false response format. Contained in the scale are eight items tapping visual processing and seven items tapping verbal processing.

Data Collection

Data used in the initial assessment of the measures were collected from undergraduate college students who voluntarily participated in two half-hour laboratory sessions for course credit. Two hundred and sixty-three subjects participated fully in the dual sessions.

In the initial half-hour session, subjects were exposed to a series of print advertisements and were asked to rate the ads under the cover of a copy-testing study at the early stages of message development. Subjects were then given a recall test (which is not pertinent to the present study). Following this, subjects were dismissed and told to return in two days for the second session. During that session subjects were again given the recall test. Following this test, the individual difference measures were separately administered at a controlled rate by the experimenter. This was done so that subjects would be discouraged from hurriedly completing the questionnaire and would take the time necessary to perform the tasks required by each instrument. Following administration of the scales, subjects were debriefed and dismissed.

MEASURE EVALUATION

Reliability

Coefficient alpha (Cronbach 1951) for the 16-item VVIQ instrument was 0.85. Examination of the item-to-total correlations indicated that each item was relatively equivalent in tapping the domain of interest, so further purification of the scale was not warranted. White et al. (1977) reviewed studies that investigated the internal consistency of the VVIQ scale and found reports for alpha ranging from 0.91 to 0.94. The results of the present study are consistent with these earlier reports, and the reliability of the VVIQ exceeds the standard for basic research of 0.80 recommended by Nunnally (1978, p. 245).

Reliability of the VIC control scale, as assessed through coefficient alpha, was 0.68. A purification analysis indicated that three items might be dropped, resulting in an alpha of 0.683. Since the increase was negligible, the scale was maintained intact for purposes of further analysis. Prior studies using the VIC scale have reported a range in alpha of 0.72 to 0.95 (White

et al. 1977). Reliability as assessed in this study is lower than but comparable with prior results; however, it is considerably below acceptable standards for a measure not in its early stages of development (Nunnally 1978).

For the VVQ measure of imaginal coding preference, coefficient alpha was 0.54. Further examination of the low item-to-total correlations identified five items as prospects for purification. Alpha for this 10-item scale was 0.56, again only a slight improvement over the published version. As Richardson (1977) reported, item nine was negatively correlated with the total score but was insignificant in magnitude ($r = -0.06$). Because this is a verbalizer/visualizer scale, internal consistency might be affected by scale multidimensionality. Therefore, two components were examined: alpha for the verbalizer items was 0.66, while coefficient alpha for the visualizer items was 0.64. Reliability, though lower than desirable, was improved from its original unidimensional level of 0.54 by treating the scale as a two-dimensional measure.

Factor Structure

Since the three measures of imaginal processing skills are purported to capture different aspects of individual differences in the processing of visual stimuli, a traditional principal components analysis was conducted to examine whether the items in the scales tap their appropriate dimensions. Results of a three-factor solution with VARIMAX rotation are shown in Table 1. Rather than display the full set of loadings, values of 0.30 and above—or the highest loading for an item—have been included.

For the vividness and control scales, the items were all positive, and all principal loadings were limited to a single factor. For the VVQ measure of style, however, seven of the 15 items exhibited higher loadings on the "vividness" and "control" factors than on the "preference" factor. Closer inspection reveals that these items relate to the visual dimension of the VVQ. Of the seven items, five hold higher loadings on the second factor (control), and two are split between factors one and two. Although it is difficult to provide a post hoc explanation, the verbal items appear to utilize a different approach from the visualizer items in tapping a style domain. The verbal items of the VVQ appear to assess a preference dimension with items such as "I *enjoy* doing work that requires the use of words." However, the visualizer dimension appears to generally lack this preferential content. Instead, items such as "My powers of imagination are higher than average," appear to tap ability dimensions and not coding preferences. Two of the items (2 and 11) refer to the vividness of the mental image, while several other items (5, 8, and 9) appear to relate to an ability to generate a mental image and thus indirectly tap the control dimension.

TABLE 1

FACTOR STRUCTURE OF VVIQ, CONTROL, AND VVQ MEASURES

Individual difference measures	Factor 1	Factor 2	Factor 3
Vividness items (VVIQ)			
1	.61		
2	.53		
3	.44		
4	.50		
5	.46		
6	.54		
7	.38		
8	.41		
9	.55		
10	.37		
11	.32		
12	.59		
13	.62		
14	.70		
15	.71		
16	.54		
Control items (VIC)			
1		.18	
2		.24	
3		.42	
4		.28	
5		.20	
6		.32	
7		.54	
8		.56	
9		.49	
10		.36	
11		.53	
12		.26	
VVQ items			
1			.56
2		.19	−.01
3			.41
4			.47
5		.37	−.02
6		.09	−.01
7			.43
8		.29	.04
9			−.17
10			.19
11	.23	.24	.07
12			.62
13	.22	.23	−.23
14			.56
15		.42	−.18

Evaluation of the VVQ measure of processing style indicates that it possesses relatively poor internal consistency and thus low reliability. Additionally, the factor analysis indicates that problems exist in selected items of the visualizer component relating to discrimination from the two ability measures, vividness, and control. To overcome these problems, additional research was undertaken to develop a more psychometrically sound measure of style of processing.

EXHIBIT

STYLE OF PROCESSING SCALE

INSTRUCTIONS: The aim of this exercise is to determine the style or manner you use when carrying out different mental tasks. Your answers to the questions should reflect the manner in which you typically engage in each of the tasks mentioned. There are no right or wrong answers, we only ask that you provide honest and accurate answers. Please answer each question by circling one of the four possible responses. For example, if I provided the statement, "I seldom read books," and this was your *typical* behavior, even though you might read say one book a year, you would circle the "ALWAYS TRUE" response.

Item	Response			
	ALWAYS TRUE	USUALLY TRUE	USUALLY FALSE	ALWAYS FALSE
1. I enjoy doing work that requires the use of words (W)	1	2	3	4
*2. There are some special times in my life that I like to relive by mentally "picturing" just how everything looked (P)	1	2	3	4
*3. I can never seem to find the right word when I need it (W)	1	2	3	4
4. I do a lot of reading (W)	1	2	3	4
*5. When I'm trying to learn something new, I'd rather watch a demonstration than read how to do it (P)	1	2	3	4
*6. I think I often use words in the wrong way (W)	1	2	3	4
7. I enjoy learning new words (W)	1	2	3	4
*8. I like to picture how I could fix up my apartment or a room if I could buy anything I wanted (P)	1	2	3	4
9. I often make written notes to myself (W)	1	2	3	4
*10. I like to daydream (P)	1	2	3	4
*11. I generally prefer to use a diagram rather than a written set of instructions (P)	1	2	3	4
*12. I like to "doodle" (P)	1	2	3	4
*13. I find it helps to think in terms of mental pictures when doing many things (P)	1	2	3	4
*14. After I meet someone for the first time, I can usually remember what they look like, but not much about them (P)	1	2	3	4
15. I like to think of synonyms for words (W)	1	2	3	4
*16. When I have forgotten something I frequently try to form a mental "picture" to remember it (P)	1	2	3	4
17. I like learning new words (W)	1	2	3	4
18. I prefer to read instructions about how to do something rather than have someone show me (W)	1	2	3	4
*19. I prefer activities that don't require a lot of reading (W)	1	2	3	4
20. I seldom daydream (P)	1	2	3	4
*21. I spend very little time attempting to increase my vocabulary (W)	1	2	3	4
*22. My thinking often consists of mental "pictures" or images (P)	1	2	3	4

NOTE: (W) = Verbal items, (P) = visual items, * = items reversed for scoring.

SCALE DEVELOPMENT

Response Alternatives

As a psychological assessment of processing, the VVQ is limited by its two-alternative, yes/no format for response. The VVIQ utilizes five response alternatives, more aptly characterizing the gradations in individual processing differences (see Cox 1980 for elaboration). To evaluate the effect of the VVQ response format, data were collected from a new group of 41 undergraduate college students. Twenty subjects were given the VVQ with the conventional yes/no alternatives, while 21 subjects responded to the VVQ using the four response alternatives shown in the Exhibit. Coefficient alphas were computed for each

component of the two versions. For the visual component, alpha increased from 0.69 to 0.76 for the four alternative format, and for the verbal component, alpha increased from 0.61 to 0.74. Thus a four response alternative format appears to generate more consistent responses and so was employed in the revised measure.

Domain Sampling

As an initial step in the revision of the VVQ items, an attempt was made to more fully explicate the domain of the construct (Churchill 1979). J. Richardson (1978, 1980) suggests that style of processing should reflect a preference for processing. A. Richardson (1977, p. 123) implies that the construct should reflect the extent to which subjects favor verbal or visual strategies when processing many different kinds of information. In his development of the VVQ, Richardson (1977) also distinguishes what he refers to as "habitual" verbalizers or visualizers. We interpret "habitual" as relating to the frequency of processing in one of the two modalities, which could in turn relate to a preference or affect for processing in a particular manner. An inspection of the VVQ reveals that six of the 15 items employ wording that relates to a preference for processing—either reflecting a particular modality (three items) or a frequency of processing (three items).

Drawing from past research, we conceptualized processing style as *a preference and propensity to engage in a verbal and/or visual modality of processing.* Consistent with this perspective, we attempted to generate a new set of items to measure processing style. The revised scale included 36 newly generated items and six items from the VVQ scale, 17 of which tap the verbal component, and 25 of which tap the visual component. The 42-item scale was administered to a new group of 35 undergraduate students in order to purify the measure (Churchill 1979). Based upon item-to-total correlations, 22 items were selected for the revised measure. The 22 items consisted of 11 items each for the two processing styles and included the six items developed in the VVQ scale that were consistent with the proposed conceptualization.[1]

MEASURE REEVALUATION: THE SOP SCALE

The revised 22-item measure is referred to as the Style of Processing (SOP) scale and is provided in the Exhibit. To evaluate its psychometric properties, an additional study was conducted that assessed the SOP's reliability and validity and compared it to the original VVQ scale.

[1]Space limitations prevent the listing of all items for the VVIQ and VIC scales; however, they are all available from the authors.

Data Collection

Data were collected from 106 undergraduate students participating in an experiment conducted at a major midwestern university. The study was made up of multiple phases; a subset yielded data relevant to the revised scale. To be consistent with the first study, subjects of the second study were told that it pertained to an evaluation of advertising at the early stages of development. During the first session subjects were asked to evaluate 10 advertisements using a series of rating scales. At the end of the first session, the subjects were given an unexpected recall test. The test consisted of relating the brand name contained in each advertisement to the product class for that brand. Subjects were given three minutes to complete the test.

Two days later, subjects participated in the second phase of the study. During this session subjects were exposed to the original 10 advertisements plus 30 advertisements that served as distractors. Subjects were required to perform a recognition task that consisted of indicating with a yes or no response whether they had previously viewed the ad. At the end of the second session, subjects were administered the individual difference measures. All subjects completed the VVIQ instrument and the Gordon measure of control (VIC). Additionally, subjects completed a 33-item social desirability scale developed by Crowne and Marlowe (1964). The Crowne and Marlowe desirability scale was used because past research has indicated that individual difference measures may be correlated with social desirability (White et al. 1977). Finally, 54 subjects completed the SOP measure of processing style and 52 completed the VVQ scale to avoid carry-over effects from similar items administered on a within-subjects basis (Keppel 1982). Following this, subjects were debriefed and dismissed.

ANALYSIS

Reliability

The reliabilities of the scales for each pool of subjects are shown in Table 2. The VVIQ results are consistent with those of the first study, while alphas for the control measure increased moderately. Reliability for the two measures of processing style differ dramatically. The SOP scale is superior to the VVQ scale in terms of internal consistency, as indicated by the reliability of linear combinations (Nunnally 1978, p. 246). This superiority appears to be independent of test length: adding seven items to the 15-item VVQ scale would only be expected to increase alpha to 0.66, in contrast to the observed alpha of 0.88 for the SOP scale (Nunnally 1978, p. 243). Additionally, closer examination of the SOP scale indicated that coefficient alpha was 0.81 for the verbal component and 0.86 for the visual component.

TABLE 2

RELIABILITIES FOR INDIVIDUAL DIFFERENCE MEASURES

Scale	Coefficient alpha Group 1 (n = 54)	Group 2 (n = 52)
SOP	.88*	–
VVQ	–	.57*
VVIQ	.84	.85
VIC	.75	.77
Social desirability	.72	.76

NOTE: * = Reliability of linear combinations

Scale Structure

As a final assessment of the items, the 22-item SOP scale was input to a confirmatory factor analysis using LISREL VI (Jöreskog and Sorbom 1983). As Ruekert and Churchill (1984) note, the results of the confirmatory factor analysis must be interpreted with caution because of the possible violation of normality underlying the maximum likelihood estimation procedure. With only four response alternatives, there is a tendency for the results to indicate a substantial lack of model fit and to suggest more factors than are actually required.

Using the hypothesized two-component orthogonal solution, the LISREL results (Table 3) are generally supportive of the measure.[2] The Chi-square for 208 degrees of freedom is 464.72 and is significant ($p < 0.001$), but likely reflects the problems indicated previously. The LISREL estimates and t-values are more encouraging. All estimates load as hypothesized, while only one item (9) had a t-value of less than 2.0. Overall, the LISREL results tend to support the structure and consistency of the SOP scale.

One issue regarding the scoring of the SOP scale should be mentioned. Some researchers might desire to treat the verbal and visual components of the SOP scale as independent dimensions and compute separate scores for each component. In this way individuals with different combinations (e.g., high-high, high-low, etc.) could be separately analyzed. While the SOP scale (with proper scoring modifications) allows such an analysis, we prefer to compute a single score representing a point on a continuum ranging from verbally oriented to visually oriented processing. Scoring the scale in this manner is more consistent with the nature of the construct it was designed to measure—preference for a style of processing. For example,

[2]The approach employed in assessing the scale structure of the SOP differs from that used in assessing the VVQ scale (Table 1) due to the ratio of observations to variables in the confirmatory factor analysis. Hair et al. (1979) recommend a ratio of four to five observations as variables while a ratio of two to one is common, although less conservative.

TABLE 3

CONFIRMATORY FACTOR ANALYSIS SOP SCALE

Item	LISREL estimates	t value
	Visual component	
2	.63	4.96
5	.45	3.29
8	.56	4.25
10	.54	4.10
11	.48	3.56
12	.46	3.37
13	.83	7.14
14	.39	2.79
16	.83	7.22
20	.50	3.69
22	.87	7.77
	Verbal component	
1	.55	4.05
3	.39	2.73
4	.64	4.88
6	.42	2.95
7	.67	5.20
9	.22	1.47
15	.61	4.59
17	.68	5.30
18	.35	2.45
19	.62	4.64
21	.77	6.29

individuals revealing both a strong verbal and visual orientation in separate scores would fall in the middle of the continuum with a single score, reflecting an absence of preference for either style of processing. The empirical value of computing separate component scores is, however, an issue worthy of further research.

Validity

A complete assessment of the validity of the individual difference measures was not the intention of the study, but several of the analyses bear on this issue. First, discriminant validity can be assessed by determining the intercorrelations among the measures, since as Campbell and Fiske (1959, p. 81) argue, "Tests can be invalidated by too high correlations with other tests from which they were intended to differ." Richardson (1978, 1980) has advocated that measures of processing style and ability be independent and thus lack high intercorrelations. Second, criterion validity of the VVQ and SOP measures could be examined through their correlations with two measures of retention collected in the study—aided recall and recognition. Individual differences in imagery vividness have been reported to be significantly related to intentional recall (Sheehan 1966), incidental recall (Morris and Gale 1974; Sheehan 1971, 1973), and paired associate learning (Hiscock and Cohen 1973). Imagery control has been reported to be related to a variety of mental tasks including paired associate learning (Mo-

TABLE 4

CORRELATIONS FOR SOP AND VVQ MEASURES

Measures	Style of processing (SOP)						Measures	Verbal-visualizer questionnaire (VVQ)					
	SOP	VVIQ	VIC	SD	RE	RECOG		VVQ	VVIQ	VIC	SD	RE	RECOG
SOP	–						VVQ	–					
VVIQ	.01	–					VVIQ	−.10	–				
Control (VIC)	−.03	.15	–				VIC	−.09	.56*	–			
Social desirability (SD)	−.00	.20	−.01	–			SD	.02	−.03	.05	–		
Recall (RE)	−.34*	−.01	.16	.00	–		RE	−.03	−.09	−.13	−.03	–	
Recognition (RECOG)	−.31*	−.10	−.18	−.03	.20	–	RECOG	−.03	.17	−.10	.10	.22	–

NOTE: * = Statistically significant at $p < 0.01$.

relli and Lang 1971) and incidental recall (Morris and Gale 1974). The VVQ was not examined with retention measures by Richardson (1977), but in general, style of processing would be expected to be a significant correlate of recall and recognition.

Discriminant Validity. The SOP scale exhibits low intercorrelations with the two measures of processing ability, supporting its discriminant validity (Table 4). Additionally, it is not correlated with the measure of social desirability. Correlations for the VVQ scale are slightly higher, but it also exhibits discriminant validity.

Criterion Validity. The SOP scale is significantly related to both aided recall and recognition of previously presented advertisements. The negative correlation indicates that retention was strongest among verbally oriented processors. This result is consistent with the findings of Richardson's (1978) study of processing style. Richardson attributes this relationship to a tendency for visualizers to engage in separative rather than interactive imagery (Bower 1970, 1972), thereby reducing the mnemonic effectiveness of mental imagery (Paivio 1969).[3]

In contrast, the VVQ scale is not correlated with either of the retention measures. Additionally, neither the VVIQ or VIC scale correlated significantly with the measures of retention. Thus, the criterion validity of the new SOP scale is supported with disconfirming evidence found for the two ability measures and the previous indicator of processing style.

DISCUSSION

Results of this research provide a mixed assessment of the four measures of individual differences in imaginal information processing. Results for the VVIQ measure of imagery vividness demonstrated stable (across both studies) and reasonably high internal consistency. The VIC measure of imagery control had reliability coefficients ranging from 0.68 to 0.77 across the two studies. Interestingly, neither of these measures of individual imagery ability were significantly correlated with measures of memory retention collected for an adjunct study. As this is the first study to examine in depth the relationship between the scale measures and memory, further studies are needed to clarify the role of imaginal processing ability in the encoding, storage, and retrieval of verbal versus visual purchase information.

For the two measures of processing style, or preference for engaging in a processing strategy, results were more divergent. The previously developed VVQ scale of processing style was found to possess relatively low reliability and exhibited problems in individual item independence from the two ability measures. The SOP measure of processing preference was found to overcome these problems and is thus preferable to the VVQ scale, although further construct validation (Peter 1981) would be appropriate. (For example, Holbrook et al. (1984) recently developed the Visualization/Verbalization Index (V/VI) which might be examined in efforts to develop a multiple indicator approach to research investigating imaginal information processing.) The SOP scale was also found to correlate with measures of advertising recall and recognition, further demonstrating the importance of considering individual characteristics in research related to consumer information processing.

[*Received September 1984. Revised January 1985.*]

[3]An alternative explanation for this result would relate to the nature of the retention measures. The recall test consisted of a verbal association of the brand name and product class and perhaps favors verbally oriented processors. The recognition test contained both a visual component (picture) and a verbal component (copy) and thus would not appear to favor either mode of processing, though the resultant correlation is similar to that obtained for the recall test. Although this supports Richardson's explanation, the interaction between the nature of the memory test and mode of processing should not be discounted in future research.

REFERENCES

Alesandrini, Kathy Lutz (1983), "Strategies that Influence Memory for Advertising Communications," in *Information Processing Research in Advertising*, ed. Richard J. Harris, Hillsdale, NJ: Lawrence Erlbaum, 665–682.

Bettman, James R. (1979), *An Information Processing Theory of Consumer Choice*, Reading, MA: Addison-Wesley.

——— and Pradeep Kakkar (1977), "Effects of Information Presentation Format on Consumer Information Acquisition Strategies," *Journal of Consumer Research*, 3 (March), 233–240.

——— and C. Whan Park (1980), "Effects of Prior Knowledge and Experience and Phase of the Choice Process on Consumer Decision Processes: A Protocol Analysis," *Journal of Consumer Research*, 7 (December), 234–248.

Biehal, Gabriel and Dipankar Chakravarti (1982), "Information-Presentation Format and Learning Goals as Determinants of Consumers' Memory Retrieval and Choice Processes," *Journal of Consumer Research*, 8 (March), 431–441.

Bower, Gordon H. (1970), "Imagery as a Relational Organizer in Associative Learning," *Journal of Verbal Learning and Verbal Behavior*, 9 (4), 529–533.

——— (1972), "Mental Imagery and Associative Learning," in *Cognition in Learning and Memory*, ed. Lee W. Gregg, New York: John Wiley.

Campbell, Donald R. and Donald W. Fiske (1959), "Convergent and Discriminant Validation by the Multitrait-Multimethod Matrix," *Psychological Bulletin*, 56 (2), 81–105.

Capon, Noel and Marian Burke (1980), "Individual, Product Class, and Task-Related Factors in Consumer Information Processing," *Journal of Consumer Research*, 7 (December), 314–326.

——— and Roger Davis (1984), "Basic Cognitive Ability Measures as Predictors of Consumer Information Processing Stategies," *Journal of Consumer Research*, 11 (June), 551–563.

——— and Richard J. Lutz (1979), "A Model and Methodology for the Development of Consumer Information Programs," *Journal of Marketing*, 43 (January), 58–67.

Childers, Terry L. and Michael J. Houston (1984), "Conditions for a Picture-Superiority Effect on Consumer Memory," *Journal of Consumer Research*, 11 (September), 643–654.

Churchill, Gilbert A., Jr. (1979), "A Paradigm for Developing Better Measures of Marketing Constructs," *Journal of Marketing Research*, 16 (February), 64–73.

Cox, Eli P., III (1980), "The Optimal Number of Response Alternatives for a Scale: A Review," *Journal of Marketing Research*, 17 (November), 407–422.

Cronbach, L. J. (1951), "Coefficient Alpha and the Internal Structure of Tests," *Psychometrika*, 16 (September), 297–334.

Crowne, D. and D. Marlowe (1964), *The Approval Motive*, New York: John Wiley.

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

Ernest, Carole H. (1977), "Imagery Ability and Cognition: A Critical Review," *Journal of Mental Imagery*, 1 (2), 181–216.

Hair, Joseph F., Jr., Rolph E. Anderson, Ronald L. Tatham, and Bernie J. Grablowsky (1979), *Multivariate Data Analysis*, Tulsa, OK: Petroleum.

Henry, Walter A. (1980), "The Effects of Information-Processing Ability on Processing Accuracy," *Journal of Consumer Research*, 7 (June), 42–48.

Hiscock, M. and D. B. Cohen (1973), "Visual Imagery and Dream Recall," *Journal of Research in Personality*, 7 (3), 179–188.

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.

———, Robert B. Chestnut, Terence A. Oliva, and Eric A. Greenleaf (1984), "Play as a Consumption Experience: the Roles of Emotions, Performance, and Personality in the Enjoyment of Games," *Journal of Consumer Research*, 11 (September), 728–739.

Inhelder, Barbel and Jean Piaget (1958), *The Growth of Logical Thinking from Childhood to Adolescence*, New York: Basic Books.

Jacoby, Jacob, Robert W. Chestnut, and William A. Fisher (1978), "A Behavioral Process Approach in Nondurable Purchasing," *Journal of Marketing Research*, 15 (December), 532–544.

Jöreskog, Karl G. and Dag Sorbom (1983), *LISREL V and VI: Analysis of Linear Structural Relations by the Method of Maximum Likelihood*, Chicago: National Education Resources.

Keppel, Geoffrey (1982), *Design and Analysis: A Researcher's Handbook*, Englewood Cliffs, NJ: Prentice-Hall.

Kisielius, Jolita and Brian Sternthal (1984), "Detecting and Explaining Vividness Effects in Attitudinal Judgments," *Journal of Marketing Research*, 21 (February), 54–64.

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

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

——— (1977), "Imagery and Consciousness: A Theoretical Review from an Individual Differences Perspective," *Journal of Mental Imagery*, 2 (2), 275–290.

Moore, William L. and Donald Lehmann (1980), "Individual Differences in Search Behavior for a Non-Durable," *Journal of Consumer Research*, 7 (December), 296–307.

Morelli, G. and D. Lang (1971), "Rated Imagery and Pictures in Paired-Associate Learning," *Perceptual and Motor Skills*, 33 (3, part 2), 1247–1250.

Morris, P. E. and A. A. Gale (1974), "A Correlational Study of Variables Related to Imagery," *Perceptual and Motor Skills*, 38 (2), 659–665.

Nunnally, Jum C. (1978), *Psychometric Theory*, New York: McGraw-Hill.

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

Park, C. Whan (1976), "The Effect of Individual and Situation-Related Factors on Consumer Selection of Judgmental Models," *Journal of Marketing Research,* 13 (May), 144–151.

Peter, J. Paul (1981), "Construct Validity: A Review of Basic Issues and Marketing Practices," *Journal of Marketing Research,* 18 (May), 133–145.

Rethans, A. and M. Hastak (1980), "Representation of Product Hazards in Consumer Memory", in *Advances in Consumer Research,* Vol. 9, ed. Andrew A. Mitchell, Ann Arbor, MI: Association for Consumer Research, 487–493.

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.

Richardson, John T. E. (1978), "Mental Imagery and Memory: Coding Ability or Coding Preference," *Journal of Mental Imagery,* 2 (1), 101–115.

——— (1980), *Mental Imagery and Human Memory,* New York: St. Martin's Press.

Rossiter, John R. and Larry Percy (1978), "Visual Imagining Ability as a Mediator of Advertising Response," in *Advances in Consumer Research,* Vol. 5, ed. H. Keith Hunt, Ann Arbor, MI: Association for Consumer Research, 621–629.

Ruekert, Robert W. and Gilbert A. Churchill, Jr. (1984), "Reliability and Validity of Alternative Measures of Channel Member Satisfaction," *Journal of Marketing Research,* 21 (May), 226–233.

Sawyer, Alan G. and Dwayne Ball (1981), "Statistical Power and Effect Size in Marketing Research," *Journal of Marketing Research,* 18 (August), 275–290.

Sheehan, Peter W. (1966), "Functional Similarity of Imagining to Perceiving: Individual Differences in Vividness of Imagery," *Perceptual and Motor Skills,* 23 (Part 3), 1011–1033.

——— (1967), "A Shortened Form of Bett's Questionnaire Upon Mental Imagery," *Journal of Clinical Psychology,* 23 (3), 386–389.

——— (1971), "Individual Differences in Vividness of Imagery and the Function of Imagery in Incidental Learning," *Australian Journal of Psychology,* 23 (2), 279–288.

——— (1973), "Stimulus Imagery Effect and the Role of Imagery in Incidental Learning," *Australian Journal of Psychology,* 25 (1), 93–102.

Smith, Ruth Ann, Michael J. Houston, and Terry L. Childers (1984), "Verbal Versus Visual Processing Modes: An Empirical Test of the Cyclical Processing Hypothesis," in *Advances in Consumer Research,* Vol. 11, ed. Thomas C. Kinnear, Provo, UT: Association for Consumer Research, 75–80.

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.