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The Role of Optimum Stimulation Level in Exploratory Consumer Behavior

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This study examines the role of optimum stimulation level (OSL) in exploratory consumer behavior. The concept of OSL and its measurement are discussed, and the literature on exploratory consumer tendencies and their relationship with OSL is reviewed. Hypotheses are developed concerning the relationship between OSL and cognitive responses to ads, ad repetition, information search, variety seeking, decision making under risk, gambling, and innovative behavior, and these hypotheses are investigated in a series of experiments. Four well-known instruments are used to measure people's characteristic preference for stimulation, and OSL is operationalized as a weighted composite of a person's score on these scales. The results of the study indicate that consumers' OSL is systematically related to curiosity-motivated consumer behaviors, variety seeking, and risk taking.

The notion that human behavior is sometimes instigated by the mere desire to attain a satisfactory level of stimulation has figured prominently among theories investigating motivational tendencies as causes of people's actions (e.g., Berlyne 1960; Fiske and Maddi 1961). Research on this presumed need for stimulation has shown that people tend to prefer intermediate levels of stimulation—referred to as the optimum stimulation level (OSL) in the literature—and that there are reliable individual differences in the amount of stimulation considered optimal by a given person (McReynolds 1971).

To attain a satisfactory level of stimulation, a person may engage in exploration of the environment. As stated by Berlyne (1963, p. 288), exploratory behavior is "behavior with the sole function of changing the stimulus field." Psychologists have studied exploratory tendencies extensively, and the general finding has been that people with higher OSLs engage in exploratory behav-

iors to a greater extent than people with lower OSLs (see, e.g., Zuckerman [1979] for a review). The fact that exploratory tendencies are related to a person's characteristic need for stimulation suggests that OSL may be a major determinant of consumer behaviors with strong exploratory elements.

The goal of this article is to provide a fairly comprehensive investigation of the role of OSL in exploratory consumer behavior. First, the concept of OSL and its measurement are discussed, and then the literature on exploratory consumer tendencies and their relationship with OSL is reviewed. Based on this review, cognitive responses to ads, ad repetition, information search, variety seeking, decision making under risk, gambling, and innovative behavior are identified as areas in which a consideration of the effects of OSL should be particularly fruitful. The relationship between OSL and these behaviors is then investigated in a series of experiments, with four major scales used to operationalize the OSL construct.

OSL AND EXPLORATORY CONSUMER BEHAVIOR

The Concept of Optimum Stimulation and Its Measurement

The basic notion of OSL theories is that the relationship between stimulation obtained from the environment or through internal means and a person's affective reaction to stimulation follows an inverted U-shaped function, with intermediate levels of stimulation perceived as the most satisfying. Several theoretical frameworks (e.g., Berlyne 1960; Fiske and Maddi 1961) have expanded on this basic principle, and, although some

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differences exist among the various theories, there is general agreement that the optimum amount of stimulation is at some (unspecified) intermediate level, that there are stable individual differences in this perceived ideal level of stimulation, that deviations from the optimum level lead to attempts to reduce or augment stimulation, and that the higher a person's characteristic need for stimulation, the greater the extent to which s/he will engage in exploratory behavior (see Raju [1981] and Raju and Venkatesan [1980] for excellent reviews).

A distinction should be made between a person's actual stimulation level and his or her OSL. Strictly speaking, it is the discrepancy between current and ideal levels that results in attempts to reduce or augment stimulation. However, as a result of the difficulties inherent in taking into account actual stimulation, previous research has almost invariably dealt with the relationship between OSL and exploratory behavior, and this article looks at OSL only as a determinant of exploratory consumer behaviors.

Several self-report measures have been developed to assess OSL, among them the Arousal Seeking Tendency (AST) scale, originally developed by Mehrabian and Russell (1973; AST-I) and later revised by Mehrabian (1978; AST-II), the Change Seeker Index (CSI) of Garlington and Shimota (1964), the Sensation Seeking Scale of Zuckerman (1979; the latest version is SSS-V), and the Novelty Experiencing Scale (NES) of Pearson (1970). The scales AST-I and AST-II measure a person's preferred arousal level. The Change Seeker Index assesses "need for variation in one's stimulus input in order to maintain optimal functioning" (Garlington and Shimota 1964, p. 919). The Sensation Seeking Scale-V measures an individual's "need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experiences" (Zuckerman 1979, p. 10). The Novelty Experiencing Scale assesses a person's "tendency to approach versus a tendency to avoid novel experiences" (Pearson 1970, p. 199). Despite the different labels, all scales purportedly measure OSL (McReynolds 1971).

Table 1 lists selected characteristics of the four scales and provides a summary of studies that have investigated the factorial structure and reliability of the four scales. The reliability of the summated scores on each scale is high. Three scales specify subfactors, but research has indicated that the factorial structure and the subfactor reliabilities of SSS-V and AST-I are in general unsatisfactory, while the factor structure of NES has not been investigated extensively (see Table 1). Consumer researchers have almost invariably used summary scores on the total scale in their research, which is consistent with the views of investigators in psychology (e.g., Rowland and Franken 1986).

Exploratory Consumer Behavior

Exploratory consumer behavior tendencies have been categorized as curiosity-motivated behaviors, variety

seeking, and risk taking (Raju 1980). Although these categories are "fuzzy" in the sense that a specific exploratory behavior may be motivated by several tendencies, this categorization is useful to structure the literature.

Curiosity-motivated Behavior. Curiosity may be defined as the desire for knowledge for intrinsic reasons. A distinction can be made between specific and diverse curiosity-motivated behavior (Berlyne 1960). The former refers to exploration of a single stimulus in depth because it arouses the consumer's curiosity. Exploration in this case is a response to a particular stimulus with given collative properties. Diverse curiosity, on the other hand, represents a tendency to seek stimulation from a variety of sources. It occurs as a reaction to a state of boredom and is not directed toward one stimulus in particular.

Variety Seeking. Variety seeking is a means of obtaining stimulation in purchase behavior by alternating between familiar choice objects (e.g., brands, stores) simply for a change of pace. Consumers, after a process of simplification of their decision process, may find themselves in a situation of boredom that is caused by a suboptimal level of stimulation derived from purchase behavior. Consequently, they may complicate the buying process with variety-seeking behavior (Howard and Sheth 1969). McAlister and Pessemier (1982) incorporate OSL into their model of variety-seeking behavior and posit that the utility derived from switching brands is positively related to consumers' OSLs.

Risk Taking and Innovative Behavior. Most conceptions of risk taking are based on some notion of "chance of loss" (Slovic 1964). The dominant theoretical position in consumer behavior is consistent with this general view, construing perceived risk as a function of two dimensions: uncertainty of consequences (i.e., the subjective probability of unfavorable outcomes) and magnitude or importance of consequences (i.e., the amount at stake; see Ross [1975] for a review). Risk taking is thought to be arousing (Slovic 1964), and OSL is therefore expected to be positively related to risk-taking behavior (Zuckerman 1979).

Among "risky" consumer behaviors, innovativeness has probably attracted the most attention in the literature. Innovative behavior, or actualized innovativeness, is the degree to which an individual is relatively earlier in adopting an innovation than other consumers (Midgley and Dowling 1978). Building on Midgley and Dowling's (1978) earlier work, Foxall and Bhat (1991) show that innovative behavior can be modeled as a function of the personality trait innate innovativeness, interest in the product category, and situational influences. Innate innovativeness is the tendency to make innovative decisions "independently of the communicated experience of others" (Midgley and Dowling 1978, p. 235). It involves a tendency to take risks and explore new solutions to consumption problems and should be positively related to OSL.

TABLE 1
SUMMARY OF PRIOR RESEARCH ON THE MEASUREMENT OF OSL

Scale	Scale characteristics			Selected studies on reliability and factor structure assessment			
	Number of items	Subfactors	Scoring system	Study	Total scale reliability	Subfactor reliabilities	Factor structure
Arousal Seeking Tendency-I	40	Change, unusual stimuli, risk, sensuality, new environments	Nine-point Likert scale	Mehrabian and Russell 1973	.87	...	Developed ^a
				Kohn, Hunt, and Hoffman 1982	.82-.86	...	...
				Wahlers and Dunn 1987	.89	.37-.76	...
				Wahlers and Etzel 1990	.85	...	Not supported
Arousal Seeking Tendency-II	32	None	Nine-point Likert scale	Mehrabian 1978	.93	NA	NA
				Wahlers, Dunn, and Etzel 1986	.89	NA	NA
Change Seeker Index	95	None	True/false	Garlington and Shimota 1964	.80-.85	NA	NA
Sensation Seeking Scale-V	40	Thrill and adventure seeking, experience seeking, disinhibition, boredom susceptibility	Forced choice pairs	Zuckerman, Eysenck, and Eysenck 1978	.83-.86	.58-.88	Developed ^a
				Ridgeway and Russell 1980	.68-.80	.44-.72	...
				Ball, Farnill, and Wangeman 1983	...	...	Weakly supported
				Rowland and Franken 1986	.74-.77	.48-.74	Weakly supported
				Wahlers and Dunn 1987	.80	.55-.75	...
				Corulla 1988	.80-.83	.58-.79	Weakly supported
				Wahlers and Etzel 1990	.85	...	Supported
Novelty Experiencing Scale	80	External sensation, internal sensation, external cognition, internal cognition	Like/dislike	Pearson 1970	.87	.76-.87	...
				Pearson 1971	...	.70-.86	...
				Kohn et al. 1982	...	.78-.88	...
				Venkatraman and Price 1990	...	.64-.73	Partially supported ^b

^aThe factor structure for the scale was developed in this article.

^bSupport was found for a second-order factor model in which the cognitive and sensory dimensions form the second-order factors, and each of these is composed of the internal and external dimensions. However, only 16 of the original 80 items were included in the confirmatory factor analysis.

Summary. There is evidence that OSL is positively correlated with each of the three categories of exploratory behavior, as each type of exploratory behavior provides the consumer with a means of increasing stimulation. It is further hypothesized that the three types of exploratory behavior are positively correlated. Although they represent different manifestations of the need for stimulation in the consumer context, the interrelationships among the different types of behavior suggest a positive correlation.

Prior Research on the Relation between OSL and Exploratory Consumer Behavior

Previous research on the relation between OSL and exploratory consumer behavior is summarized in Table 2. The review is self-explanatory, and the studies listed in Table 2 will not be discussed in detail. The results are in general supportive of the relation between OSL and each of the three broad exploratory consumer behavior tendencies.

Although previous research has contributed greatly to our understanding of the role of OSL in exploratory consumer behavior, several limitations are apparent from Table 2. First, most studies have only dealt with broad exploratory tendencies, often measured by Raju's (1980) scale, and not with specific exploratory behaviors that consumers actually engage in.

Second, previous research has typically measured OSL using one particular measurement instrument (with AST-I being predominant). Thus, it is assumed that the various OSL scales can be used interchangeably or that the scale employed is the most valid instrument for the measurement of OSL. To our knowledge, neither assumption has been tested rigorously, although Wahlers et al. (1986) present some evidence that SSS-V may be inferior to AST-I and AST-II.

Third, previous research has used research designs in which OSL and the exploratory consumer tendencies investigated were measured in a single session. Particularly when exploratory behavior is assessed with a self-report instrument measuring general exploratory tendencies, this will enhance observed relationships because of shared-methods variance.

Fourth, despite a good deal of previous research, there are still gaps in our understanding of the relationship between OSL and exploratory consumer behavior. Research on curiosity-motivated behavior has given little attention to consumer reactions toward specific stimuli (specific curiosity). Studies relating variety seeking to OSL have generally relied on self-report measures of variety-seeking tendencies in general, while research on variety seeking within specific product categories has typically not considered OSL as an explanatory variable. Risk taking has been studied mostly in terms of innovativeness, although innovative behavior toward a single product has not been studied. In the next section, research hypotheses will be developed with respect to each of these issues.

RESEARCH HYPOTHESES

In this section we propose hypotheses about the relationship between OSL and specific exploratory behaviors within each of the three categories identified above, namely, curiosity-motivated behaviors (responses to ads, information seeking), variety seeking (menu choices), and risk taking and innovativeness (decision making under risk, gambling, and innovative behavior toward a specific brand).

Cognitive Responses to Ads

In addition to deriving stimulation from external sources, individuals may also obtain stimulation through internal means. Thinking has been recognized as an important source of stimulation (see, e.g., Pearson 1970), and thinking about ads may be such a source of internal stimulation. Of particular relevance in the present context are curiosity-based thoughts (Wright 1973). In a study by Rethans, Swasy, and Marks (1986), for example, curiosity-based responses about the product or ad accounted for 17 percent of the total number of responses. Previous research has not studied the role of OSL in the generation of cognitive responses to ads in general and curiosity-based responses in particular, but optimum stimulation theory suggests the following hypothesis:

- H1:** Individuals with higher OSLs will generate more cognitive responses to an ad, especially curiosity-motivated responses, than individuals with lower OSLs.

Repetition of Ads

Several researchers have suggested the application of optimum-stimulation theory to ad repetition (Faison 1977; Raju 1981). Exploratory-behavior researchers have also shown considerable interest in the effects of repetition on the degree of affect toward a stimulus. Berlyne (1970) proposed the two-factor theory in which repetition is hypothesized to have both a positive influence on liking for an object due to learning and a negative influence due to tedium.

We hypothesize that OSL moderates the relationship between repetition and attitude toward the ad (A_{ad}) such that the effect of repetition on A_{ad} is more positive (or less negative) for individuals with lower OSLs than for individuals with higher OSLs.¹ Individuals with higher OSLs need more stimulation and therefore

¹The actual A_{ad} for individuals with high and low OSLs will depend on the collative properties of the ad. For example, those with high OSLs may like complex ads more than those with low OSLs, at least at low levels of repetition, whereas the opposite may be true for simple ads. However, regardless of the type of ad, it is expected that, given a certain ad and a certain number of repetitions, the hypothesis is valid as a result of greater tedium experienced by those with high OSLs.

may become bored with the ad at an earlier stage since, with increased repetition, those with higher OSLs should experience greater tedium than those with lower OSLs. Thus, we have the following hypothesis:

- H2:** Individuals with higher OSLs will experience more tedium than individuals with lower OSLs during repeated exposures to the same ad, and the effect of repetition on A_{ad} will therefore be less positive for the former than the latter.

Information Seeking

Research on consumer information seeking has played a prominent role in consumer behavior. Broadly speaking, two motives may underlie information seeking, namely, acquisition of information as a means to some further end (in the consumer context often the purchase of a brand) and information seeking out of curiosity in order to learn more about the environment. In the latter case the acquisition of information is an end in itself. Only the second type of information seeking can be considered exploratory. It may therefore be hypothesized that individuals with higher OSLs search for more information than those with lower OSLs when information acquisition is motivated by curiosity. There is no reason to assume that OSL has an effect on "purposeful" information search behavior.

Previous research on the relation between OSL and information seeking (see Table 2) is ambiguous because most studies used Raju's (1980) scale and some items in that scale contain elements of both types of information seeking (e.g., "I rarely read advertisements that just seem to contain a lot of information"). To get a better understanding of the role of OSL in information seeking, the two motives that may underlie information search need to be disentangled and their interactive relation with OSL has to be investigated.

- H3:** Individuals with higher OSLs will not search for more information than individuals with lower OSLs when information acquisition is motivated by some further end, but individuals with higher OSLs *will* search for more information than individuals with lower OSLs when information acquisition is motivated by curiosity.

Variety-seeking Behavior

Previous research has tended to relate OSL to variety-seeking tendencies in general (see Table 2). Although much research exists that explores variety seeking within specific product categories, this work has typically not considered OSL as an explanatory variable (e.g., Pessemier and Handelsman 1984). Pessemier and Handelsman (1984) did recognize its potential importance, however, and found evidence for the relation between variety-seeking behavior and two variables related to OSL, age and innovativeness.

Most prior research on variety seeking has focused on purchase sequences, with variety-seeking behavior's being operationalized with such measures as the number of different brands chosen or the degree to which choices are concentrated. These measures are easy to understand, and the required data are easy to collect, but information is lost about "the dissimilarity of the brands chosen by an individual and the extent of the change an individual experiences from one purchase occasion to the next" (Pessemier and Handelsman 1984, p. 437). For this reason, measures focusing narrowly on purchase sequences may have weak relationships with their antecedents. Given that brands are bundles of attributes and that consumers derive stimulation value from differences in attributes between the brand currently purchased and the brand previously chosen (McAlister and Pessemier 1982), it is desirable to take attribute perceptions into account in research on variety seeking and OSL. As described in more detail below, these considerations guided the design of the experiment to test the following hypothesis:

- H4:** Individuals with higher OSLs will exhibit more variety-seeking behavior in a product category than individuals with lower OSLs.

Decision Making under Risk and Gambling

Many consumer choices are risky because there is usually some chance that a chosen course of action will have unfavorable consequences. Much of the research on risky decision making has been concerned with demonstrations of how frequently people's choices deviate from normative standards such as the expected-utility model and with attempts to develop theories that are more in line with observed choice behavior (e.g., Kahneman and Tversky 1979). Some studies have investigated factors that influence people's propensity to avoid or seek risk in choices, but there is little research linking risk taking in decision making under uncertainty to individual differences in general and to OSL in particular. In this article we propose the following hypothesis:

- H5:** Individuals with higher OSLs will be more willing to make risky choices than individuals with lower OSLs.

Gambling is a form of risk-taking behavior that has attracted little attention in the consumer-behavior literature, despite the fact that people from all strata of society engage in it. It is an "extreme" form of risk-taking behavior in that in most gambling settings, the expected value of the bet is at most equal to the bet itself. Gambling behavior is difficult to explain with expected utility models and the assumption that most people are in general risk averse, but it may be influenced by a person's OSL.

- H6:** Individuals with higher OSLs will be more likely to gamble and possibly gamble for

higher stakes than individuals with lower OSLs.

Innovative Behavior

Midgley and Dowling (1978) specified innovative behavior at three levels: a specific single product, a specific product category, and across a number of product categories (approaching generalized innovative behavior). They argue that these levels of innovative behavior are conceptually distinct and that results cannot be expected to generalize from one level to another without research. Previous research has indicated a strong relation between OSL and the latter two types of innovative behavior. To our knowledge, there is a paucity of research on the relation between OSL and the most specific level of innovative behavior, namely, innovativeness toward a single product. This study therefore investigates the relationship between OSL and the choice of a specific new brand.

H7: Individuals with higher OSLs will be more willing to try out new brands than individuals with lower OSLs.

ASSESSMENT OF FOUR OSL SCALES

Method

Questionnaires containing the four OSL scales were constructed, with the order of the scales rotated according to a Latin squares design.² To simplify the task for subjects, all items were scored on five-point scales, ranging from -2 to +2 (with endpoints of strongly disagree/strongly agree, completely false/completely true, or strongly dislike/strongly like, as appropriate). This represents a departure from the scoring system usually used for these scales. In the case of AST-II, CSI, and NES, the modifications are minor (i.e., the use of a uniform five-point scale instead of a nine-point or dichotomous scale). For SSS-V, one of the two forced-choice alternatives in each item was randomly selected, which resulted in 21 positively worded and 19 negatively worded statements. These were then rated on Likert (agree-disagree) scales. The major reason for these changes was that dichotomous scoring systems (as generally used with CSI, SSS, and NES) have undesirable psychometric properties (e.g., underestimation of factor loadings, correlated measurement errors) when analyzing their factorial structure with factor-analytic techniques (Bollen 1989).

The questionnaires were administered to undergraduate students enrolled in marketing classes. Participa-

tion in the study was voluntary, but a lottery with several cash prizes was used to attract volunteers. The scales were distributed in class, and students were encouraged to return the completed questionnaires to the next class meeting. Complete data were obtained from 223 subjects.

Results and Discussion

Principal components analysis was applied to each scale to investigate the dimensionality of the four instruments. Scree plots of the eigenvalues suggested a single underlying factor for AST-II and CSI, which is consistent with the hypothesized factor structure.³ The plot of the eigenvalues did not show strong evidence for the hypothesized four-dimensional structure for SSS-V and NES. For SSS-V, this confirms earlier findings (see Table 1). It should be noted that for both SSS-V and NES the total score on all items is often used as a summary measure for OSL. The eigenvalues, however, did not show strong evidence for a single underlying factor.

The means, standard deviations, and reliabilities of the summated scales and their intercorrelations are reported in the upper portion of Table 3.⁴ The means and standard deviations shown in Table 3 are not directly comparable to those reported in other studies because of the changes in scoring, but if the responses are linearly transformed to the usual metric, they are in close agreement with the norms provided in the literature.⁵ Thus, the changes in scoring apparently did not unduly affect the results.

Confirmatory factor analysis using LISREL 7 (Jöreskog and Sörbom 1988) was applied to the correlation matrix of the summated ratings to assess the convergent validity of the four OSL scales. Convergent validity is achieved when the factor loadings are significant, provided that the overall fit of the model is acceptable. The LISREL results are shown in the lower portion of Table 3. All fit indices indicated a reasonably good fit of the unidimensional model, and all four scales loaded significantly on the underlying construct, OSL ($p < .001$). The factor loadings for CSI and AST-II were higher than those for SSS-V and NES. On the basis of convergent validity considerations it therefore appears that CSI and AST-II are somewhat better operational-

³The eigenvalues for the first five factors were as follows: AST-II (8.16, 2.05, 1.72, 1.52, 1.45); CSI (13.07, 4.63, 4.17, 3.01, 2.70); SSS-V (5.60, 3.01, 2.35, 1.88, 1.64); NES (10.96, 7.72, 5.18, 2.87, 2.43).

⁴The reliabilities of the subscales of SSS-V were TAS .79, ExS .50, Dis .72, and BS .50; for NES they were ES .89, IS .84, EC .81, and IC .88.

⁵In particular, for SSS-V (for which the changes in scoring were the most pronounced) the transformed mean of 19.05 corresponds closely to the figures reported in previous research (e.g., Zuckerman 1979). Furthermore, the common finding that males rate higher on SSS than females was obtained as well ($t(221) = 4.10, p < .001$). The reliabilities and correlations among the scales are also in line with previous research (e.g., Wahlers et al. [1986] and the studies summarized in Zuckerman [1979]).

²Data on Raju's (1980) scale were also collected with this questionnaire to assess its psychometric properties and its validity for measuring general exploratory tendencies. These results are outside the scope of the present article, which deals only with the relationship between OSL and specific exploratory behaviors (*not* general exploratory tendencies). See Baumgartner and Steenkamp (1991) for a more detailed discussion of the results for Raju's (1980) scale.

TABLE 2

SUMMARY OF PRIOR RESEARCH ON THE RELATIONSHIP BETWEEN OSL AND EXPLORATORY BEHAVIOR

Exploratory consumer behavior tendency/study	Type of exploratory consumer behavior studied	Measure of exploratory consumer behavior	OSL scale	Findings
Curiosity-motivated behavior:				
Raju 1980	Information seeking; exploration through shopping; interpersonal communication	Raju's scale	AST-I	Significant correlation with all three types of exploratory behavior (r 's ranging from .218 to .278)
Goodwin 1980	Attention to new ads	Looking time	AST-I	No significant effect on looking time at ads that vary on three collative properties
Price and Ridgway 1982	Vicarious exploratory behavior ^a	Raju's scale	AST-I	Significant correlation with vicarious exploratory behavior ($r = .33$)
Joachimsthaler and Lastovicka 1984	Information seeking	Raju's scale	AST-I	Substantial effect on information seeking (no significance level provided)
Venkatraman and MacInnis 1985	Verbal and sensory information seeking	Self-report scales developed by authors	SSS-V	No difference between high and low SSSs on either type of exploratory information seeking ^b
Wahlers et al. 1986 ^c	Information seeking; exploration through shopping; interpersonal communication	Raju's scale	AST-I, AST-II, SSS-V	AST-I and AST-II significantly correlated with information seeking and exploration through shopping (r 's ranging from .297 to .393); no significant relations for SSS-V
Variety seeking:				
Raju 1980	Brand switching; repetitive behavior proneness	Raju's scale	AST-I	Significant correlation with both types of exploratory behavior (r 's ranging from .356 to .438)
Raju 1984	Brand switching	Self-reported intention to switch	AST-I	Positive association with brand switching for homemakers but not for students
Venkatraman and MacInnis 1985	Variety seeking for functional and aesthetic products	Self-report scales developed by authors	SSS-V	Subjects with high SSSs rate slightly higher on both types of exploratory behavior than those with low SSSs ^b
Wahlers et al. 1986 ^c	Brand switching; repetitive behavior proneness	Raju's scale	AST-I, AST-II, SSS-V	AST-I and AST-II significantly correlated with both types of exploratory behavior (r 's ranging from .297 to .334); SSS-V only significantly correlated with repetitive behavior proneness ($r = .230$)

TABLE 2 (Continued)

Exploratory consumer behavior tendency/study	Type of exploratory consumer behavior studied	Measure of exploratory consumer behavior	OSL scale	Findings
Risk taking and innovative behavior:				
Grossbart, Mittelstaedt, and DeVere 1976	Adoption process for recycled urban retail facilities	Self-reported awareness; consideration of shopping; symbolic acceptance; trial; adoption	SSS-II	Subjects with high SSSs score significantly higher on all aspects of the adoption process than those with low SSSs
Mittelstaedt et al. 1976	Adoption process for new products and retail facilities	Self-reported awareness; time of awareness; consideration of purchase/shopping; symbolic rejection; trial; time of trial; trial rejection; adoption	SSS-II	Compared to low SSSs, high SSSs are (1) more likely to be aware of, consider shopping at, try, and adopt new retail facilities, (2) are more likely to try and reject new products, (3) are less likely to symbolically reject new retail facilities and products, and (4) have a shorter decision time between awareness and trial of new products
Raju 1980	Generalized innovative behavior; risk taking	Raju's scale	AST-I	Significant correlation with both types of exploratory behavior (r 's ranging from .465 to .622)
Price and Ridgway 1982	Use innovativeness ^d	Self-report scale developed by authors	AST-I	Significant correlation with use innovativeness ($r = .500$)
Joachimsthaler and Lastovicka 1984	Generalized innovative behavior	Raju's scale	AST-I	Substantial effect on innovativeness (no significance level provided)
Venkatraman and MacInnis 1985	Generalized innovative behavior for functional and aesthetic products	Self-report scales developed by authors	SSS-V	Subjects with high SSSs rate higher on both types of exploratory consumer behavior than those with low SSSs ^b
Wahlers et al. 1986 ^c	Generalized innovative behavior; risk taking	Raju's scale	AST-I, AST-II, SSS-V	AST-I and AST-II significantly correlated with both types of exploratory behavior (r 's ranging from .391 to .511); no significant relations for SSS-V
Venkatraman and Price 1990	Generalized innovative behavior	Self-rated importance of innovation attributes of products; purchase behavior/intentions to buy	NES ^e	Significant relation with (1) importance of innovation attributes and (2) new product purchase (but relation was negative for one out of three products)

^aVicarious exploratory behavior is a combination of Raju's (1980) information seeking, exploration through shopping, and interpersonal communication.

^bNo significance tests between high and low SSS were provided in the article.

^cWahlers et al. (1986) also applied principle components analysis to Raju's scale. As their factors yielded in general lower correlations with the OSL scales than Raju's original categorization, these results are not reported here.

^dUse innovativeness is defined by Price and Ridgway (1982) as innovative behavior in the consumption context by using products in multiple, possibly new, ways.

^eVenkatraman and Price (1990) used a modified version of NES (see also Table 1).

izations of OSL than NES and SSS-V. The AST-II scale and CSI did about equally well in terms of reliability and convergent validity, but AST-II is easier to use

since, with 95 items, CSI is rather long. The composite reliability of OSL as indicated by the four summated scales was .83.

TABLE 3
SCALE STATISTICS FOR FOUR OSL SCALES AND RESULTS
OF CONFIRMATORY FACTOR ANALYSIS

Scale	Mean	SD	Correlations			
			AST-II	CSI	SSS-V	NES
Scale statistics:						
AST-II	13.59	15.44	(.890) ^a			
CSI	18.99	32.28	.759	(.915)		
SSS-V	-3.80	15.64	.534	.598	(.806)	
NES	36.13	30.57	.455	.411	.425	(.913)
Confirmatory factor analysis:						
		Standardized factor loading	SE	Trait variance	Error variance	
AST-II		.851	.059	.724	.276	
CSI		.886	.058	.785	.215	
SSS-V		.665	.063	.442	.558	
NES		.510	.066	.260	.740	

NOTE.—Goodness-of-fit measures are as follows: $\chi^2(2) = 9.1$ ($p = .011$), GFI = .981, RMR = .033, RNI = .980, and TLI = .940. RNI is McDonald and Marsh's (1990) Relative Noncentrality Index. TLI is the Tucker and Lewis (1973) index.

^aReliability estimates shown in parentheses on the diagonal.

EXPERIMENTS

Overview of the Experiments

Seven experimental tasks, administered in a single one-hour study, were conducted to investigate the seven hypotheses proposed earlier. The subjects for the study were selected randomly from the pool of respondents who had completed the OSL scales in the first phase of this project. A research assistant called up potential subjects about four weeks after the initial data collection and invited them to participate in a marketing study for a payment of \$10. A total of 111 undergraduates were recruited in this way, and 108 subjects provided usable responses during both waves of data collection. Participants were run in groups of 6–15 subjects in 10 experimental sessions, and each subject participated in all seven experiments described below. At the conclusion of the study, participants were asked to comment on the purpose of the study. No subject linked the experiments to the questionnaire filled out earlier.

The data from the seven experiments were related to people's OSL scores as operationalized by factor scores obtained from the LISREL analysis.⁶ Since a weighted

composite of individual scale scores is the most reliable and parsimonious indicator of OSL, only the findings for factor scores are discussed in detail.⁷ Some interesting differences in results across the four OSL instruments are pointed out in the General Discussion section. Following Labovitz (1968), a .10 standard of statistical significance is adopted since correlations involving personality constructs have generally been rather weak, the exploratory behavior measures are related to scale scores that were collected a month earlier, and the sample size is relatively small.

Experiment 1: Cognitive Responses to Ads

Procedure. All subjects were exposed to a stream of 13 television commercials. Subjects were told that the study was an advertising pretest in which they would be shown a series of commercials and that they would have to evaluate some of them. The target ad for the first experiment was the first ad in the series. It was an ad for the British newspaper *The Independent*. None of the subjects had seen the ad before.

Measures. Immediately after seeing the commercial, subjects were asked to write down all the things that they had thought about while watching the ad. Two judges who were blind to the experimental condition of the subjects categorized subjects' cognitive responses into individual thoughts (interjudge agreement = 98 percent). Subjects produced on average 4.1 thoughts. Subsequently, each response was coded as either reflecting or not reflecting curiosity (interjudge agreement = 94 percent). Curiosity responses include asking of questions, posing of problems, and expressions of interest in additional information about the product or ad (Wright 1973). Noncuriosity responses include overt evaluations, conclusions, and descriptions of characteristics of the ad.

Results. In Hypothesis 1 it was proposed that higher OSLs would generate more cognitive responses while watching an ad, especially responses of a curiosity type, than lower OSLs. The results support this hypothesis. Both the correlation between OSL and the total number of thoughts produced ($r = .142$, $df = 106$, $p < .10$) and the correlation between OSL and the number of curiosity responses generated ($r = .221$, $df = 106$, $p < .05$) were significant.

The results were stronger for the number of curiosity responses generated than for the total number of thoughts produced. This suggests that some types of thinking are more relevant for internal stimulation than others. Cognitive responses include thoughts that may not contribute much to stimulation, such as repetition of information about the product or ad. It appears, therefore, that OSL leads primarily to more inquisitive thinking.

⁶We thank a reviewer for suggesting the use of factor scores in these analyses. As pointed out by the reviewer, different methods are available to estimate factor scores (see Lastovicka and Thamodaran 1991). In the present study, bivariate correlations between the factor scores as computed by the four methods exceeded .98 in all cases. We report the results for what Lastovicka and Thamodaran (1991) call Method III, which is the method used by LISREL.

⁷Specific results for each individual OSL scale are available from the authors on request.

mation as they wanted, and the computer unobtrusively recorded their information search behavior.

After subjects indicated that they had looked at enough information (and, in the choice condition, had made a choice), they rated their information-search behavior on two seven-point Likert scales: "In looking at the cars, I gathered information just out of curiosity," and "In looking at the cars, I was just browsing through the information available." The summated rating on these scales ($r = .54$) served as a manipulation check. Fifty-three subjects provided usable responses in the choice condition, and 54 subjects participated in the curiosity condition.

Results. Subjects in the curiosity condition scored significantly higher on the curiosity measure than subjects in the choice condition ($\bar{X} = 7.98$ and 5.89 , respectively; $t(105) = 3.53$, $p < .001$). This result indicates that curiosity was manipulated successfully.

Information search was operationalized as the total number of cells for which subjects requested information. To investigate the effects of OSL on information search, the number of pieces of information looked at was regressed on a person's experimental condition (coded as -1 for choice and $+1$ for curiosity), OSL, and their interaction. A significantly positive interaction was expected, indicating that information seeking and OSL would be more strongly related in the curiosity condition than in the choice condition. The following regression analysis shows that the hypothesized result was obtained (SEs in parentheses):

$$\begin{aligned} \text{Search} = & 28.4 + 1.17 \times \text{Task} + 0.64 \times \text{OSL} \\ & (.695) \quad (.708) \\ & + 1.06 \times \text{Task} \times \text{OSL} \\ & (.708) \end{aligned}$$

Although the overall regression was not significant ($F(3,103) = 1.88$, NS), two individual effects were significant. First, there was a significant main effect of task, which means that subjects in the curiosity condition looked at more information than subjects in the choice condition ($t(103) = 1.69$, $p < .05$). Second and more important, the interaction between task set and OSL was significant ($t(103) = 1.50$, $p < .10$). Specifically, in the choice condition there was no relationship between information search and OSL ($t(103) = -.44$, NS), whereas in the curiosity condition information search was positively correlated with OSL ($t(103) = 1.62$, $p < .10$). The effect size estimate for the interaction (expressed as a correlation coefficient) was $.147$. Hypothesis 3 was therefore supported.

Discussion. The effect of OSL on information search in the curiosity condition was in the expected direction, but it was not very strong. One reason for this may be that the experiment was too abstract and/or that the task-set manipulation (choice vs. curiosity) was not strong enough. It is interesting that Raju (1980) also found that OSL was only weakly related to infor-

mation seeking. Another reason might therefore be that it is very difficult to separate true exploratory information seeking from goal-directed information seeking. Hirschman (1980) has suggested that exploratory information seeking might serve two purposes, stimulation and use in future decision making, and this may also account for the weak effects found in the present study.

Experiment 4: Variety Seeking

Method. The stimuli were 22 dishes available at various fast food restaurants, such as a Whopper with fries, two slices of Neapolitan pizza with pepperoni, and chef salad. The prices of the dishes were about the same, and they are all available in the vicinity of the campus.

As argued above, measures of variety-seeking behavior should take into account the perceived dissimilarity among brands. The necessary data were obtained as follows. For each dish, subjects were asked to indicate which attributes, out of eight possible (good tasting, contains much fat, nutritious, highly processed, strong flavor, wholesome, contains many additives, low in calories), they thought were applicable to that dish. This task was carried out immediately after the ad experiment. Choice of the attributes was based on pilot studies and a review of the literature.

After the information-seeking task, data on choices of dishes were obtained. Subjects were told to assume that they had won a contest by a local radio station that allowed them to go out for dinner to various fast food restaurants for the entire week. However, they had to plan their menu a priori for the entire week. They were presented with a list of 22 dishes and chose for each day the dish they wanted.

Analysis and Results. Pessemier and Handelsman (1984) have developed a sophisticated measure for variation in consumption, the Index of Temporal Variety (ITV). The index consists of three distinct components, pertaining to the dissimilarity of the chosen products (PRD), the degree to which choices are evenly distributed across stimuli (PRE), and the relative frequency with which the chosen item changes from one purchase occasion to the next (RNB). Subjects' ratings on PRE and RNB can be obtained from subjects' choices of dishes, but in order to compute PRD one has to take into account perceptual distances among dishes.⁸ A subject's rating on ITV is obtained by summing the ratings on PRD, PRE, and RNB (see Pessemier and Handelsman [1984] for details). A higher rating represents more variation in consumption of the dishes.

⁸At the individual level, the perceptual data constitute a 22×8 matrix, filled with ones (attribute applicable to the dish in question) and zeros (attribute not applicable). These data were aggregated across consumers and subjected to correspondence analysis to construct a perceptual map. A two-dimensional map explained 91.8 percent of the variance and was used to compute the PRD measure.

It was expected that subjects' ratings on ITV would be positively related to their scores on OSL.

The results confirmed this hypothesis. Subjects with higher OSLs engaged in variety seeking to a significantly greater extent than subjects with lower OSLs ($r = .178$, $df = 106$, $p < .05$). Hypothesis 4 was therefore supported. The correlation between the number of different dishes chosen and OSL was not significant ($r = .098$), which is consistent with the argument made earlier that measures focusing solely on purchase sequences are a weak measure of variety-seeking behavior.

Experiment 5: Decision Making under Risk

Method. In this experiment, a procedure developed by Keller (1985) was used to study decision making under risk. Subjects were presented with a set of nine choice problems concerning different kind of cars (Porsche, new convertible Volkswagen, regular 1970 Volkswagen). In each problem they had to choose between two options, a higher-risk alternative (HR) or a lower-risk alternative (LR). Compared to LRs, HRs potentially led to more desirable outcomes, but the likelihood of obtaining them was lower.⁹ Note that the structure of the task corresponds to the conceptualization of perceived risk as a function of uncertainty of consequences and magnitude of outcomes.

Results. Over all nine choice problems, the average number of choices of HRs was 5.6, which is in close agreement with the figure reported by Keller (5.2). The correlation between the number of HRs chosen and OSL was .216 ($df = 106$, $p < .05$). Hypothesis 5 was therefore supported.

Experiment 6: Gambling

Method. As mentioned earlier, subjects received \$10 for their participation in the experiments, and they were given the opportunity to gamble with this money. They had to indicate how much to gamble. Subjects had a 50 percent chance to double this amount and a 50 percent chance to lose it. The outcome was determined by the random number generator of the computer. It was stressed that this random number generator was completely unbiased.

Results. A logistic regression of whether or not a person decided to gamble on OSL indicated that subjects with higher OSLs were significantly more likely to gamble than those with lower OSLs ($t(106) = 2.70$, $p < .01$). The corresponding effect-size estimate, expressed in terms of a correlation coefficient, was .253. The correlation between the amount gambled and OSL

was also significant ($r = .141$, $df = 106$, $p < .10$). Thus, Hypothesis 6 was supported.

Experiment 7: Innovative Behavior

Method. At the end of the experimental session, subjects were invited to choose one package of chewing gum as a further reward for their participation. Two brands were available, both peppermint sugar-free gums, but one brand was a well-known U.S. brand (Carefree) while the other was a major brand sold in Europe (Stimorol). Stimorol was a new brand in the sense that it was unfamiliar to subjects. It was expected that higher OSLs would choose Stimorol significantly more often than lower OSLs.

Results and Discussion. A logistic regression of whether or not a person chose the unknown brand Stimorol on OSL yielded a t -value of .21, which was not significant (effect size estimate of .020). Hypothesis 7 was therefore not supported.

One possible explanation for this negative result is that Stimorol can be regarded as a continuous innovation, and OSL may not be related to brands that are only incrementally removed from established alternatives (cf. Foxall 1986).

Meta-analysis of Findings for OSL

A meta-analysis was performed to obtain an estimate of the mean effect size across all seven experiments, its associated probability, and a test of the homogeneity of the effect sizes across experiments. The correlation coefficient between OSL and the various exploratory consumer behaviors was employed as the estimate of effect size. A Fisher $r - z$ transformation was applied to the individual effect sizes, while their associated p -values were transformed to standard normal deviates.¹⁰ The mean effect size was estimated by averaging the transformed individual effect sizes and transforming this average back to the corresponding correlation. The method of adding z -values was used to assess the significance of the relation between OSL and exploratory consumer behavior, and a chi-square test was employed to test for heterogeneity of the effect sizes (see Rosenthal 1984 for details).

The mean effect size for the relationship between OSL, as operationalized by factor scores, and exploratory consumer behavior was .166, which is significant ($p < .001$). The effect sizes were homogeneous ($\chi^2(6) = 3.01$; $p > .50$), although the effect size for the innovative behavior experiment is smaller than the ones in the other experiments.

⁹An example of a choice problem used in the experiment is as follows: HR (20% chance of a regular 1970 Volkswagen, 60% chance of a Porsche, or 20% chance of nothing) vs. LR (20% chance of a regular 1970 Volkswagen or 80% chance of a new convertible Volkswagen).

¹⁰In the studies on cognitive responses, ad repetition, and gambling, two dependent measures of interest were obtained. The average of the effect sizes and p -values for the two measures in these three experiments (after applying the appropriate transformations) was entered into the meta-analysis.

GENERAL DISCUSSION

Consumers' exploratory tendencies are important determinants of many consumer behaviors and should therefore be of significant interest to consumer researchers. Several well-known theories in psychology suggest that the extent to which a person engages in exploratory behavior is a function of his or her OSL. To the best of our knowledge, this is the first study that systematically investigates the relationship between OSL and a wide range of specific exploratory consumer behaviors in an experimental setting. Previous research either has related OSL to self-report measures of broad exploratory tendencies (e.g., using Raju's scale) or has only dealt with one aspect of exploratory behavior (e.g., the adoption of innovations as in the study by Mittelstaedt et al. [1976]). The present study also used four alternative instruments to assess a person's enduring need for stimulation in an effort to measure the OSL construct as validly and reliably as possible. This again is in contrast to past work in this area, which has generally relied on a single measurement instrument to assess consumers' OSLs. Finally, the data on OSL were collected one month before the administration of the experimental tasks so that demand effects could be controlled for and the long-term effects of OSL could be investigated.

The results of this study indicate that consumers' OSLs are systematically related to curiosity-motivated behavior, variety seeking, and risk taking. No support was found for the role of OSL in innovative behavior toward a specific product. The size of the effects was generally not very large, but this is not completely unexpected if one considers previous findings on the strength of the relationship between general personality scales and specific behaviors (Kassarjian and Sheffet 1991). It has been questioned whether these scales are of any value at all in consumer research. Given this pessimistic state of affairs and the fact that general trait measures were used to predict specific behaviors one month in the future, our results are remarkably consistent. Furthermore, our mean effect size of .166 is in line with effect sizes found in other consumer behavior experiments (Peterson, Albaum, and Beltrami 1985).

Although we did not present detailed results on individual OSL scales because of space limitations, our findings indicate that the four OSL instruments do not perform equally well in all tasks. The Change Seeking Index yielded the most consistent results across all experimental tasks, although its effect sizes in the curiosity-motivated behavior experiments were smaller than those of AST-II. Both CSI and AST-II loaded highly on the underlying construct of OSL in the LISREL analysis and yielded the most convincing evidence with respect to factorial structure. This suggests that these two scales are to be recommended in future research. It is interesting that CSI has actually not been used very much in past research on OSL. One reason for this might be that with 95 items the scale is rather long. A fruitful

avenue for future research might be to investigate how the scale could be shortened without sacrificing its nomological validity.

As always, some limitations should be kept in mind when interpreting the results. First, the research was conducted with a convenience sample of undergraduate business students. Although this should not compromise the internal validity of the studies, the results may not readily generalize to other subject populations. Second, the questionnaire containing the four OSL scales was rather lengthy, and subjects were asked to complete it without supervision. If anything, these limitations should weaken observed relationships, and the fact that the reliabilities for the scales were uniformly high and that the results predicted by theory were consistently obtained across experiments would seem to indicate that these problems did not adversely affect our research. Third, for some of the scales we did not adhere to the usual scoring conventions because of the methodological problems that they entail. Again, the evidence presented earlier suggests that these changes did not adversely affect the validity and reliability of measurement, but future research should investigate these issues in more detail. Fourth, some experimental tasks may have been somewhat artificial (particularly the information-seeking and menu-composition tasks). Although an effort was made to investigate specific behaviors that correspond to relevant exploratory tendencies, future research should study these issues in other contexts.

Based on our research, we feel that some areas of exploratory behavior offer especially great potential for future research. One area is specific curiosity, and more particularly the effect of OSL on consumer responses to collative properties of stimuli. This is an important field of inquiry, and little empirical research is available. For example, one would expect that consumers with higher OSLs have a greater preference for complex, ambiguous, and novel ads than consumers with lower OSLs. Furthermore, research on the moderating effect of OSL on the relation between collative properties and consumer responses need not be restricted to ads. The theoretical framework may also be fruitfully employed to understand consumer reactions to other types of stimuli such as aesthetic objects.

Another important area is innovativeness. Innovative behavior can occur at three different levels. Research in which the relative importance of OSL at each level is quantified is needed. In this research, other variables such as inherent innovativeness and involvement with the product category should also be included to understand possible differences in the role of OSL at each level. The Midgley-Dowling-Foxall model described earlier may be a useful framework in this research.

Finally, previous research, including the present study, has concentrated on OSL as an enduring disposition, and the general finding has been that people who are high in this disposition engage in exploratory behaviors to a greater degree than other people. Future

research may give attention to the actual level of stimulation and the role of the discrepancy between the actual and the optimal level of stimulation in explaining exploratory tendencies. Some promising work has been carried out by Wahlers and Etzel (1985), who found that discrepancy scores yielded marginally better results than OSL scores alone. A related issue is how to measure actual stimulation level. Wahlers and Etzel (1985) developed the life-style stimulation scale to measure actual level of stimulation, and Zuckerman (1979) describes a state sensation seeking scale, but not much research has been conducted with these scales. The potential for future work in this exciting area is great, and we hope that other researchers will continue to investigate the role of OSL in exploratory consumer behaviors.

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