Effects of Brand Logo Complexity, Repetition, and Spacing on Processing Fluency and Judgment

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It is generally accepted that repeated exposure to an advertisement can influence liking for an advertisement and for the brand names and product packages included in the advertisement. Although it has often been assumed that repeated exposure leads to a direct affective response, more recent evidence suggests that prior exposure leads to processing fluency at the time of judgment. It is a misattribution about the source of this processing fluency that results in preference for the stimulus. To date, the majority of research on the processing fluency/attribution hypothesis has focused on when people will make fluency-based attributions, while assuming the amount of the processing fluency is a direct function of exposure. In this article, we propose that stimulus characteristics and presentation factors will interact with repetition to determine the amount of processing fluency associated with a stimulus at various levels of exposure. Four studies are used to test whether two-factor theory or dual-process theory provides a better account of the source of the processing fluency. Implications for logo design are discussed.

There is a considerable amount of evidence that incidental exposure to marketing communications can influence consumer behavior. Janiszewski (1988, 1990, 1993) finds that incidental exposure to advertisements can influence liking for an advertisement and for the brand names and product packages included in the advertisement (see also Anand, Holbrook, and Stephens 1988). Hawkins and Hoch (1992) demonstrate that incidental exposure to consumer trivia encourages consumers to believe that these statements are true when they are encountered at a later time. Shapiro (1999) shows that incidental exposure to an advertisement increases the likelihood that the product will subsequently be judged acceptable for inclusion in a consideration set.

Although judgments about preference, truth, and acceptability would seem to involve significantly different processes, recent theories of mere exposure have proposed that all of these biases are the result of a common misattribution process. The processing fluency/attribution model proposes that prior exposure to a stimulus makes the stimulus easier to perceive, encode, and process when it is encountered at a later time (Bornstein and D'Agostino 1992, 1994). When asked to make a judgment involving a previously seen stimulus, people often fail to recognize that the facilitation they experience when processing the stimulus is a result of prior exposure. In this situation, they often misattribute this processing fluency to liking, truth, or acceptability. These misattributions are made as long as the context associated with the judgment makes the attribution plausible (Klinger and Greenwald 1994; Whittlesea 1993).

To date, most research on the processing fluency/attribution model has concentrated on identifying situations in which attributions of processing fluency occur or do not occur (Jost, Kruglanski, and Nelson 1998). Less attention has been paid to understanding the source of the processing fluency, the assumption being that more exposure leads to more fluency. Yet, from a marketing perspective, it is the relationship between stimulus characteristics, repetition, processing fluency, and judgment, not just processing fluency and judgment, that will assist in developing recommendations for effective banner ads, logos, and related exposure-intensive marketing communications. Understanding these relationships should allow us to integrate recommendations for the design of logos and promotional material (e.g., Henderson and Cote 1998) with current theories of the relationship between repeated exposure and judgment.

This article compares two theories that can provide insight into how stimulus characteristics and presentation schedules

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may impact the processing fluency associated with a stimulus at any level of exposure. Based on Berlyne's (1970) two-factor theory, we predict that the processing fluency resulting from a series of exposures is a function of the amount of learning that occurred during the exposures. Based on Groves and Thompson's (1970) dual-process theory, we predict that the processing fluency resulting from a series of exposures is a function of a response potential determined by the perceptual and semantic characteristics of the stimulus. Although both theories are well established, neither has been investigated as a potential explanation for the changes in processing fluency that occur with repeated exposure. Thus, each model can be used to make novel predictions about how fluency will change as a consequence of repeated exposure. A series of four experiments is used to investigate competing predictions with respect to stimulus meaning and stimulus presentation schedule. The data are consistent with the dual-process theory and are instructive for the design of logos and promotional material in situations where consumers associate varying degrees of meaning with the logos.

MERE EXPOSURE

Over the past century, hundreds of studies have demonstrated that prior exposure to a stimulus predisposes a person toward the stimulus when it is encountered at a later time (Bornstein 1989; Fechner 1876; Maslow 1937; Zajonc 1968). It has been shown that repeated exposure to nonsense syllables, words, slogans, abstract drawings, pictures, faces, and clothing increases positive affect toward these stimuli (Bornstein 1989). It has also been shown that the exposure effect is robust with respect to smells (Lorig 1992; Porter and Winberg 1999), food (Capaldi 1996; Sullivan and Birch 1990), and sounds (Anand, Holbrook, and Stephens 1988; Obermiller 1985; Peretz, Gaudreau, and Bonnel 1998). Even in animal populations, repeated exposure to the same environment, food, and social companions creates a preference for these stimuli (Hill 1978). Across all of these studies, the general finding is a logarithmic relationship between the frequency of exposure and the affective response to a stimulus.

Although there are a large amount of data showing a logarithmically increasing relationship between exposure and an affective response, there are also numerous demonstrations of nonlogarithmic response curves. In a review of 208 studies investigating the affect-exposure relationship, Bornstein (1989) finds that 75 percent of the studies show a positive relationship between the frequency of exposure and affect. Of the remaining studies, 11 percent show no relationship or an inverted-U relationship between exposure and affect, and 14 percent show a negative relationship between exposure and affect. As a consequence, most modern explanations of mere exposure include some combination of opponent processes—a process that allows for exposure to generate a positive effect and a countervailing process or processes that allow for exposure to generate a negative effect.

Processing Fluency/Attribution Model

Currently, the most popular explanation of the mere exposure effect is the processing fluency/attribution model (Bornstein and D'Agustino 1992, 1994; Klinger and Greenwald 1994). The fundamental premise of the model is that repeated exposure to a stimulus will result in a representation of the stimulus in memory. When the stimulus is encountered at a later time, the memory representation will facilitate the encoding and processing of the stimulus and make processing more fluent (Jacoby, Kelley, and Dywan 1989; Mandler, Nakamura, and Van Zandt 1987). People will make attributions about this processing fluency according to the context and their memory. For example, if the context requires the person to make a judgment about liking, and experience has taught a person that easily processed stimuli are liked, then the person should attribute fluency with the stimulus to liking (Klinger and Greenwald 1994). These attributions of fluency are automatic, effortless, and do not require conscious or strategic processing of the stimuli (Bornstein and D'Agostino 1992; Bornstein, Leone, and Galley 1987; Jacoby, Kelley, and Dywan 1989; Seamon, Marsh, and Brody 1984).

The opponent process to processing fluency depends on awareness of the source of the processing fluency, that is, the prior stimulus presentations. When people recognize that they have had previous exposures to a stimulus, they have a competing explanation for the source of the processing fluency associated with the stimulus. Awareness of the prior exposures allows a person to attribute the processing fluency to the prior exposures, but not to liking, and to correct for the bias created by the fluency (Bornstein and D'Agostino 1992, 1994; Klinger and Greenwald 1994). Although awareness of the prior exposures is conscious, the corrective role this knowledge plays in the attribution process is also thought to be automatic and effortless (Bornstein and D'Agostino 1994; Klinger and Greenwald 1994). Moreover, this correction process only occurs when contextual cues make the attribution of processing fluency to the prior exposure a viable interpretation of the fluency (Bornstein and D'Agostino 1992, 1994; Whittlesea 1993).

There is a considerable amount of evidence in support of the processing fluency/attribution model. First, there is evidence supporting predicted differences between subliminal and supraliminal presentations of stimuli. Subliminal presentations of stimuli result in a monotonic relationship between exposure and affect because there is no opportunity to attribute the fluency to prior exposures. In contrast, supraliminal presentations of stimuli result in a monotonic, inverted-U, or no relationship between exposure and affect depending on the timing and the amount of correction for the processing fluency bias (Bornstein 1989; Bornstein and D'Agostino 1992, 1994; Klinger and Greenwald 1994). Second, attributions about the source of the processing fluency have been shown to be sensitive to contextual cues. In addition to attributing fluency to liking, people have attributed fluency to the fame of a name (Jacoby et al. 1989), truth of a statement (Begg and Armour 1991; Hasher, Goldstein, and

Toppino 1977; Hawkins and Hoch 1992), message comprehensibility (Masson 1995), duration of a stimulus presentation (Witherspoon and Allan 1985), and stimulus clarity (Mandler et al. 1987; but see Seamon, McKenna, and Binder 1998). Third, there are other sources of processing fluency, independent of prior exposure, that have a similar influence on judgments of repetition and liking. Whittlesea (1993) shows that varying the acuity of a stimulus, via the density of a noise mask at the time of judgment, can influence judgments about whether the stimulus was repeated. Reber, Winkielman, and Schwarz (1998) show that a 25 millisecond contour prime enhances the evaluation of a novel stimulus and that high-contrast stimuli are rated as prettier than low-contrast stimuli. In each case, the fluency is not caused by prior presentation but by a manipulation of factors surrounding the presentation of the stimulus at test (cf. Whittlesea and Williams 2000).

The bulk of research on the processing fluency/attribution model has focused on the attribution process (Bornstein and D'Agostino 1994; Jost et al. 1998; Klinger and Greenwald 1994; Kruglanski, Freund, and Bar-tal 1996). One important finding is that the attributions about the source of processing fluency depend on the consistency between stimulus characteristics and judgment characteristics. For example, Klinger and Greenwald (1994) exposed people to positive, neutral, and negative names and then asked subjects to judge if the name belonged to a famous senator or not (study 6) or to a famous criminal or not (study 7). They found that previously exposed names were more likely to be judged as a senator's name, but only if they were positive names, whereas previously exposed names were more likely to be judged as a criminal's name, but only if they were negative names. A second important finding is that attributions about the source of processing fluency may be given more or less weight in a judgment owing to competing processing demands. Kruglanski et al. (1996) exposed high school students to positive and negative abstract paintings and found that repeated exposure led to positive paintings being more liked and negative paintings being more disliked. They also found that time pressure slightly increased reliance on the attributions about the source of the fluency information, whereas evaluation apprehension reduced reliance on these attributions.

The processing fluency/attribution model explains increasing, decreasing, and inverted-U relationships between exposure and affective response as the result of context-induced attributions about the source of the processing fluency. Yet, except for hypothesizing that more exposure leads to more processing fluency, our understanding of the factors that influence the amount of repetition-based processing fluency is limited. Thus, it would be worthwhile to examine how processing fluency might increase, or decrease, with repeated exposure. This would allow us to explain nonmonotonic repetition-response curves in situations where people are unlikely to make corrective attributions owing to awareness about the source of their processing fluency.

REPETITION-BASED SOURCES OF PROCESSING FLUENCY

A discussion of the sources of repetition-based processing fluency must address both its nature and its changes over time. Exposure to stimuli has been shown to create two types of fluency—perceptual fluency and conceptual fluency. Perceptual fluency occurs when exposure to a stimulus creates a feature-based representation of a stimulus that facilitates encoding and processing of the stimulus when viewed at a later time (Bornstein and D'Agostino 1994; Jacoby et al. 1989; Janiszewski 1988, 1990, 1993; Shapiro 1999). Conceptual fluency occurs when exposure to a stimulus creates a meaning-based representation of a stimulus that facilitates encoding and processing of the stimulus when viewed at a later time (Shapiro 1999; Shapiro, MacInnis, and Heckler 1997; Whittlesea 1993). Whittlesea (1993) has found that both perceptual and conceptual fluency are a natural consequence of exposure to a stimulus and that both types of fluency can bias judgments about stimulus repetition, liking, truth, acceptability, and so on. In contrast, only conceptual fluency can influence judgments about meaning, unless the judgment context in some way encourages the person to misinterpret the perceptual fluency as conceptual. Consistent with Whittlesea's predictions, Shapiro (1999) provides evidence that both perceptual and conceptual fluency can influence stimulus-based consideration set formation when the alternatives in the choice set are identical to previously exposed stimuli, whereas only conceptual fluency can influence stimulus-based consideration set formation when alternatives in the choice set are not identical to the original presentation of the stimulus.

Although there have been no studies investigating how perceptual and conceptual fluency change with each additional exposure, there is some evidence that conceptual fluency exhibits more variability across different levels of exposure. First, when meaningless stimuli are used as targets, the exposure-affect curve often reaches an asymptote by 25 milliseconds of exposure (e.g., Seamon et al. 1984). The implication is that the implicit memory trace that supports perceptual encoding forms quickly. Second, instructions that encourage the elaboration of features do not interact with exposure frequency, whereas instructions that encourage the elaboration of meaning do increase the slope of the exposure-affect curve (Seamon et al. 1995, experiments 2 and 3). The implication is that perceptual fluency cannot be made stronger provided the duration of the first presentation is sufficient. In contrast, conceptual fluency can be made stronger via elaboration. Third, meaningful stimuli show stronger exposure-affect response curves than meaningless stimuli (Bornstein 1989). In other words, conceptual fluency has the potential to increase over time without instruction. Thus, conceptual fluency would appear to be more sensitive to repeated exposure.

Two theories have the potential to predict the relative amount of conceptual fluency a person will experience at any level of exposure with any given stimulus. Berlyne's

(1970) two-factor theory proposes that repeated exposure to a stimulus can result in learning and, subsequently, boredom, and that these processes dictate the affective response to a stimulus. Groves and Thompson's (1970) dual-process theory proposes that the repeated exposure to a stimulus influences the excitation (a tendency to respond) and the inhibition (a tendency not to respond) of a generalized response system. These processes may also dictate the affective response to a stimulus. Each of these theories can be adapted to explain how processing fluency changes with repeated exposure.

Two-Factor Model

Berlyne (1970) proposed that the affective consequences of exposure to a stimulus are a function of learning and satiation (see also Stang 1974). Berlyne argued that learning reduced uncertainty, and this reduction in uncertainty was experienced as positive affect, whereas satiation created boredom that was perceived as negative affect. Berlyne hypothesized that variability in the novelty and complexity of stimuli would dictate the amount of learning and satiation at different levels of exposure.[1] For example, the more novel (complex) the stimulus, the greater the opportunity for learning and the greater the opportunity for a positive affective response. Similarly, the more novel (complex) the stimulus the less the opportunity for boredom and less the opportunity for a negative affective response. Hence, the exposure-response curve for novel (complex) stimuli should be monotonically increasing. In contrast, familiar (simple) stimuli allowed for quicker learning, hence the maximum affective response should be reached with fewer exposures. Familiar (simple) stimuli should also satiate more quickly, hence the exposure-response curve for these stimuli should be an inverted-U or monotonically decreasing.

Although Berlyne's (1970) two-factor theory was not originally designed to account for conceptual fluency, it provides a surprisingly good explanation of the relationship between exposure and affect in contexts where corrective attributions are unlikely (Bornstein 1989; Bornstein, Kale, and Cornell 1990; Bornstein et al. 1987). Learning is an elaborative process in which a stimulus becomes more easily understood, much like conceptual fluency increases with repeated exposure to meaningful stimuli. Thus, novel stimuli should allow for more learning, and more conceptual fluency, than familiar stimuli. Similarly, satiation or boredom often involves attention to other stimuli, internal or external, that interfere with the processing of the target stimulus. To the extent that satiation involves attending to other stimuli, there should be interference with the semantic representation of the target stimulus and conceptual fluency should decline. Thus, repetition of familiar (simple) stimuli should result in a faster rate of learning, experienced as increased conceptual fluency, and subsequently a faster rate of satiation, experienced as decreased conceptual fluency, relative to novel (complex) stimuli.

The primary advantage of viewing learning and satiation as sources of conceptual fluency is that it provides a parsimonious means of integrating historical evidence of different exposure-response curves for different stimuli and different presentation schedules into current theories of mere exposure. More important, integrating two-factor theory into the processing fluency/attribution model allows the model to explain nonmonotonic relationships between exposure and affective responses under conditions that are not likely to motivate corrective attributions. For example, without relying on corrective attributions, the two-factor model predicts a negative response curve when learning is limited and satiation is extensive, an inverted-U response curve occurred when learning and satiation are moderate, and a positive response curve when learning is extensive and satiation is limited.

Dual-Process Theory

Groves and Thompson's (1970) dual-process theory provides a competing explanation of the relationship between stimulus characteristics, repeated exposure, and processing fluency (cf. Kaplan and Werner 1991; Peeke and Petrinovich 1984). The dual-process model posits that the response to a stimulus is a function of sensitization and habituation. Sensitization is a nonspecific, nonmonotonic excitatory response that builds during initial exposures to a stimulus, but declines with later exposures. The sensitization resulting from exposure to a particular stimulus depends on stimulus intensity (i.e., high-contrast stimuli are more stimulating than low-contrast stimuli, perceptually complex stimuli are more sensitizing than simple stimuli) and stimulus significance (i.e., functionally significant stimuli are more stimulating than irrelevant stimuli). As stimulus intensity increases, sensitization increases at a decreasing rate (Fechner 1887; Groves and Thompson 1970; Kaplan and Werner 1986).

Habituation is a neural-specific inhibitory response that increases at a marginally decreasing rate with each additional exposure (Groves and Thompson 1970). Habituation depends on stimulus intensity, with less intense stimuli generating stronger, and more rapid, habituation (Groves and Thompson 1970). Habituation also depends on the interval between repeated exposure, with massed exposures accelerating the habituation process (Groves and Thompson 1970; Kaplan and Werner 1986). In a single stimulus environment, stimuli with more intensity, be it perceptual or conceptual, are less habituated and are more likely to elicit a response. In a multistimulus environment, the stimulus with the most intensity should have the least amount of habituation and, thus, should be most likely to elicit a response. Of course, to the extent stimuli in a multistimulus environment have been present for varying amounts of time, their respective levels of habituation will be a function of

[1] Berlyne used the term "habituation" to describe the uncertainty reduction that results from repeated exposure. Berlyne's use of the term "habituation" is in conflict with the more traditional use of the term to describe a reduction in responsiveness to a stimulus. As such, we use the term learning to describe the reduction in uncertainty caused by repeated exposure to a stimulus.

both their intensity and their exposure time (Glass and Holyoak 1986).

It is possible that the sensitization and habituation associated with a stimulus combine to create the processing fluency associated with the stimulus. If this is so, the dual-process model predicts that different types of stimulus complexity should lead to different levels of processing fluency. For example, the model predicts that increasing the conceptual complexity of a stimulus along a single dimension should increase neural activity associated with that dimension, result in increased sensitization and reduced habituation, and lead to an increase in processing fluency. In contrast, increasing the conceptual complexity of stimulus by adding competing dimensions to a stimulus should increase sensitization owing to the additional areas of neural activity, but it should also increase habituation because there will be habituation associated with each independent source of the sensitization. Thus, increasing stimulus complexity by adding material on competing dimensions should lead to smaller increases in conceptual fluency than increasing complexity by adding material along the same dimension. Consistent with this prediction, Shapiro (1999) increases the unidimensional complexity of a product display by adding a consistent background scene and finds increased conceptual fluency. In contrast, when Shapiro increases the multidimensional complexity of a product display by adding an inconsistent background scene, he observes no change in conceptual fluency.

THEORY COMPARISON AND HYPOTHESES

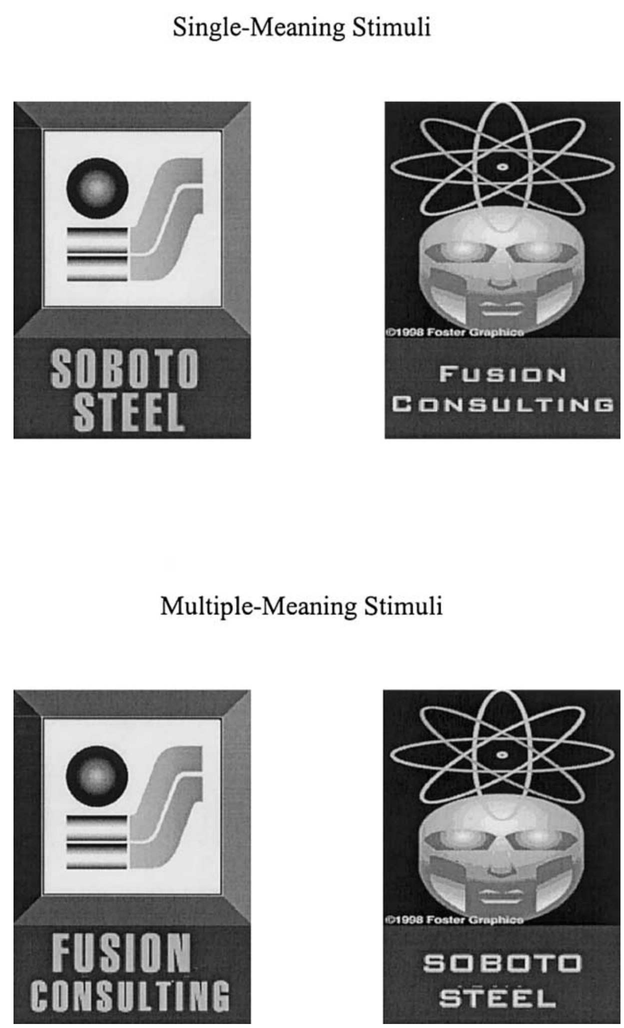
Two-factor theory and dual-process theory provide competing explanations about how repeated exposure might create changes in conceptual fluency and, by extension, influence judgments about liking, truth, acceptability, and so on. Two-factor theory is a theory about learning (Obermiller 1985; Sawyer 1981). Two-factor theory can be used to posit that learning about a stimulus is responsible for changes in conceptual fluency that in turn dictate the amount of judgment bias at different levels of exposure. Dual-process theory is a theory about how a stimulus-response potential changes over time. Dual-process theory can be used to posit how changes in the neural responsiveness to characteristics of a stimulus can combine to create conceptual fluency that in turn biases judgments about the stimulus.

Comparing the two theories creates both methodological and conceptual challenges. Methodologically, any comparison of the two theories requires a procedure that controls for the potential influence of the corrective attributions often observed in mere exposure research, but at the same time allows us to observe responses at different levels of exposure. Our solution was to ask people to choose between two stimuli that had been presented an equal number of times, but had different characteristics. By observing the choice patterns at different levels of exposure, we could make inferences about the relative rate at which learning and satiation (two-factor model), or sensitization and habituation (dual-process model), were occurring and, at the same time, assume any corrective attributions were equivalent across the two stimuli.

Conceptually, comparing the two theories requires the manipulation of a stimulus characteristic that can differentially influence the opportunity to learn (two-factor theory) and the significance of the stimulus (dual-process theory). For example, consider a novel brand logo that consists of a meaningful picture, a brand name, and an industry descriptor. In one stimulus set, called single-meaning, the brand name and the industry descriptor (henceforth referred to as brand name) are consistent with the picture. The top panel of Figure 1 shows a Soboto Steel logo in which the pictorial components (steel ball, metal tubing, SS for Soboto

FIGURE 1

SAMPLES OF SINGLE-MEANING AND MULTIPLE-MEANING STIMULI



Steel) are consistent with the meaning of the brand name. In a second stimulus set, called multiple-meaning, the brand name is unrelated to the picture. The bottom panel of Figure 1 shows a Soboto Steel logo in which the pictorial components are not consistent with the meaning of the brand name. The measure of interest is the change in relative preference for stimuli of these types (i.e., single-meaning vs. multiple-meaning) at different levels of exposure.

The two theories predict a different pattern of relative preference at different levels of exposure. Two-factor theory predicts initial exposures to the multiple-meaning stimuli should result in more learning and less satiation, and hence more conceptual fluency and more positive affect, than the initial exposures to the single-meaning stimuli. Thus, as the number of exposures increase, preference for the multiple-meaning stimuli relative to the single-meaning stimuli should increase. At some point, learning about the multiple-meaning stimuli should become complete, and the person should start to satiate to this class of stimuli. With repeated exposure, the person's satiation with the multiple-meaning stimuli should approach their satiation with the single-meaning stimuli and the preference for multiple-meaning stimuli over single-meaning stimuli should decline. This prediction can be stated as follows:

H1: Initial exposures to single-meaning and multiple-meaning stimuli should result in increasing preference for the multiple-meaning stimuli relative to the single-meaning stimuli, whereas subsequent exposures should result in decreasing preference for the multiple-meaning stimuli relative to the single-meaning stimuli.

Dual-process theory predicts that the response to a stimulus is a function of the general sensitization level and the habituation specific to each dimension of the stimulus. Sensitization should be slightly stronger for multiple-meaning stimuli relative to single-meaning stimuli. Multiple-meaning stimuli should have a broader pattern of neural activation (i.e., more neurons activated), whereas single-meaning stimuli should have a deeper level of neural activation (i.e., higher rate of firing on neurons activated). Because sensitization is additive across neurons, but intensity increases sensitization at a decreasing rate, a multidimensional increase in complexity (multiple-meaning) should create more sensitization than an unidimensional increase in complexity (single-meaning; Fechner 1887; Groves and Thompson 1970). However, habituation should also be greater for the multiple-meaning stimulus than the single-meaning stimulus. The degree of habituation is inversely related to stimulus intensity (Groves and Thompson 1970). The single-meaning stimuli should have significant overlap in the neural activation patterns associated with the picture and the brand name and, hence, should have a lesser degree of habituation than the multiple-meaning stimuli. There should be more habituation to the multiple-meaning stimuli because habituation is neurally specific, and the multiple-meaning stimuli should have a broader, shallower pattern of neural activation.

We expect that the sensitization advantage that the multiple-meaning stimulus has relative to the single meaning stimulus will be less than the habituation disadvantage that the multiple-meaning stimulus has relative to the single-meaning stimulus at moderate levels of exposure. The multiple-meaning stimulus will have less than twice the sensitization, but will have more than double the habituation. Thus, as the number of exposures increase, preference for the multiple-meaning stimuli relative to the single-meaning stimuli should decrease because the multiple-meaning stimuli are habituating at a much faster rate. As exposures continue, habituation to the multiple-meaning stimuli should reach an asymptote, while habituation to the single-meaning stimuli should continue to increase. Thus, preference for the multiple-meaning stimuli over the single-meaning stimuli should increase at higher levels of exposure. This prediction can be stated as follows:

H2: Initial exposures to single-meaning and multiple-meaning stimuli should result in decreasing preference for the multiple-meaning stimuli relative to the single-meaning stimuli, whereas subsequent exposures should result in increasing preference for the multiple-meaning stimuli relative to the single-meaning stimuli.

EXPERIMENT 1

The hypotheses were tested in the context of exposure to brand logos. People received zero, one, two, three, five, eight, 12, or 16 one-second exposures to single-meaning and multiple-meaning brand logos. Subsequently, they were asked to express a preference between single-meaning and multiple-meaning logos that had been presented an equal number of times.

Stimuli and Procedure

A pretest was used to select 32 complex business logos.[2] Initially, a set of 120 novel business logos were gathered from the Internet and arranged in a pretest booklet. Twenty-five respondents were asked to judge each logo using seven-point unfamiliar/familiar and simple/complex scales. Afterward, subjects were asked to guess the industry of the business represented by each logo.

The experimental stimuli were selected to be novel (all stimuli had a mean rating of less than 2.20 on the seven-point familiarity scale and were from the lower third of the distribution of stimuli) and complex (all stimuli had a mean rating of at least 4.0 on the seven-point complexity scale and were from the upper third of the distribution of stimuli). The most popular guess of each company's industry was not mentioned by more than 28 percent of the sample for any of the selected logos.

[2]The original design included 32 complex and 32 simple stimuli. The 32 simple stimuli showed a nonsignificant effect of repeated exposure on choice, as predicted by either model.

Stimuli were divided into four groups of eight stimuli. Two versions of each group of stimuli were constructed. The single-meaning version of a stimulus was the original logo, a fictional brand name, and an industry descriptor (e.g., bank, electronics, software). The industry descriptor was not related to the most popular industry associated with the logo in the pretest, but it was consistent with the pictorial information in the logo (see Fig. 1). The multiple-meaning version of a logo was the original stimulus and a brand name/industry descriptor that was unrelated to the pictorial information in the logo (see Fig. 1). The unrelated industry descriptors for the multiple-meaning version of the stimuli were randomly drawn from the consistent descriptors for the other seven stimuli in the group on a subject by subject basis. Thus, the only difference between single-meaning and multiple-meaning stimuli was whether the brand name/industry descriptor was consistent or inconsistent with the logo. The single-meaning stimuli presented a single, consistent meaning, whereas the multiple-meaning stimuli presented two discordant meanings.

Exposure to the stimuli was accomplished in the context of a concentration-type game played on a computer. To provide exposure to the stimuli, subjects were asked to find three stimuli hidden behind six rectangles on the screen. Each time a stimulus was uncovered, the logo appeared for one second and then was replaced by a colored rectangle. The next screen of six rectangles loaded as soon as the third stimulus was uncovered and displayed. Prior to starting the task, subjects were informed that there was a pattern to the hidden stimuli and that this pattern would emerge over a number of screens. They were told that their performance would improve as they learned the pattern and that the best way to learn the pattern was to relax and let their intuition guide their choices. They were also told the computer would report a running total of the number of rectangles they had selected in the upper-left-hand corner of the screen.

The assignment of stimuli to screens and rectangles had both predetermined and random components. At the start of the game, two of the four groups of stimuli were randomly assigned to the multiple-meaning condition, and the remaining two groups were assigned to the single-meaning condition. The computer selected one of the two multiple-meaning stimulus groups and one of the two single-meaning stimulus groups to use in the first 32 trials. On the odd-numbered trials, three of the eight multiple-meaning stimuli were hidden behind three of the six rectangles on the screen. On the even-numbered trails, three of the eight single-meaning stimuli were hidden behind three of the six rectangles on the screen. Across the 16 screens with hidden multiple-meaning stimuli, the eight stimuli in the group appeared zero (control), one, two, three, five, eight, 12, and 16 times for a total of 47 presentations. One filler stimulus filled the forty-eighth presentation. The same was true for the 16 single-meaning stimuli screens. After exposure to the first two groups of stimuli, the remaining two groups (one single-meaning, one multiple-meaning) of stimuli were presented using another 32 screens. The assignment of stimuli to exposure frequency, level of meaning, and order (first vs. second block of 32 screens) was random.

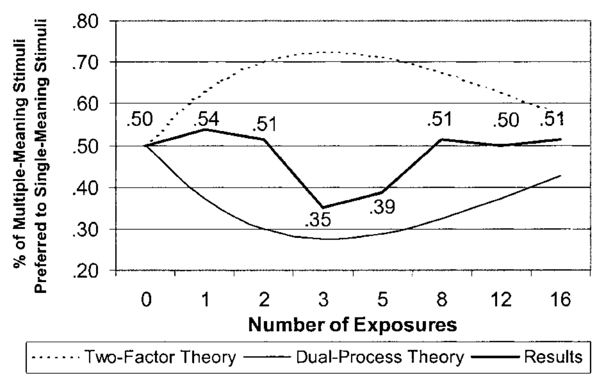
After all of the blocks of stimuli had been presented, subjects were asked to express their preference for the logos by making a forced choice between a multiple-meaning stimulus and a single-meaning stimulus that had been presented an equal number of times within the first block of 32 trials. The zero, one, two, three, five, eight, 12, and 16 repetition pairs were presented in random order, and the placement of any one item from a pair (e.g., left side or right side of screen) was random. Choices were then made for the stimulus pairs shown in the second block of trials.

Predictions and Results

The predictions, expressed as the relative preference for multiple-meaning stimuli over single-meaning stimuli at different levels of exposure, are shown in Figure 2. Two-factor theory predicts relative preference for the multiple-meaning stimuli over single-meaning stimuli will increase with initial exposures, then decrease with subsequent exposures (Hypothesis 1). There should be more learning, and positive affect, associated with the multiple-meaning stimuli during the initial exposures. There should also be more satiation, and negative affect, associated with the multiple-meaning stimuli during the later exposures. Dual-process theory predicts relative preference for the multiple-meaning stimuli will decrease with initial exposures, then increase with subsequent exposures (Hypothesis 2). There should be more sensitization, and an increased tendency to respond, associated with the single-meaning stimuli during the initial exposures. There should also be more habituation, and a decreased tendency to respond, associated with the single-meaning stimuli during the later exposures. Note that these curves can represent the probability of choosing either type

FIGURE 2

EXPERIMENT 1 PREDICTED AND OBSERVED RESULTS: PREFERENCE FOR MULTIPLE-MEANING STIMULI OVER SINGLE-MEANING STIMULI AT DIFFERENT LEVELS OF EXPOSURE



of the stimuli in a forced choice task, thus they are representative of the expected choice shares for the two types of stimuli in experiment 1.

Forty undergraduate students participated in the experiment for extra credit. The results are presented in Figure 2. Choice shares for the multiple-meaning stimuli were .50 in the no exposure condition, .54 at one exposure, .51 at two exposures, .35 at three exposures, .39 at five exposures, .51 at eight exposures, .50 at 12 exposures, and .51 at 16 exposures. To test the predictions of the two models, the repetition factor was coded as a quadratic contrast. Repetition did show a quadratic effect on relative choice share between the single-meaning and multiple-meaning stimuli across various levels of repetition ($F(7, 273) = 5.85$, $MSE = .22$, $p < .05$). People were indifferent between the single-meaning and multiple-meaning stimuli at zero exposures ($t(39) = 0.0$, $p > .10$), preferred the single-meaning stimuli most at three exposures ($t(39) = 2.62$, $p < .01$), and were again indifferent at eight exposures ($t(39) = 0.0$, $p > .10$) and thereafter.

Discussion

The data from experiment 1 are consistent with the predictions of dual-process theory. Preference shifted toward the single-meaning stimuli with initial exposures, then back toward the multiple-meaning stimuli with subsequent exposures. The dual-process theory hypothesized that the initial exposures to the single-meaning stimuli allowed for more sensitization and less habituation relative to the multiple-meaning stimuli. People experienced greater increases in processing fluency with the single-meaning stimuli at the time of choice, resulting in an increased likelihood of choosing the single-meaning stimuli over the multiple-meaning stimuli. Subsequent exposures to the single-meaning stimuli resulted in habituation. This reduction in response potential meant a reduction in the fluency advantage for the single-meaning stimuli at the time of choice, resulting in a lower likelihood of choosing the single-meaning stimuli.

Although the data from study 1 are inconsistent with two-factor theory, it is possible to reinterpret the stimuli in a manner that would allow two-factor theory to explain the data. For example, it could be argued that the single-meaning stimuli provided a better opportunity to learn (i.e., they were richer stimuli). This interpretation of the stimuli allows two-factor theory to predict that single-meaning stimuli allowed for greater learning and a greater increase in affect during initial exposures (exposures 1–3), whereas this affect dissipated as people satiated to the single-meaning stimuli (exposures 5–8). In contrast, the multiple-meaning stimuli, despite their label, provided little opportunity to learn anything and satiated at the first trial. We refer to this reinterpretation of the stimuli as an alternative two-factor explanation.

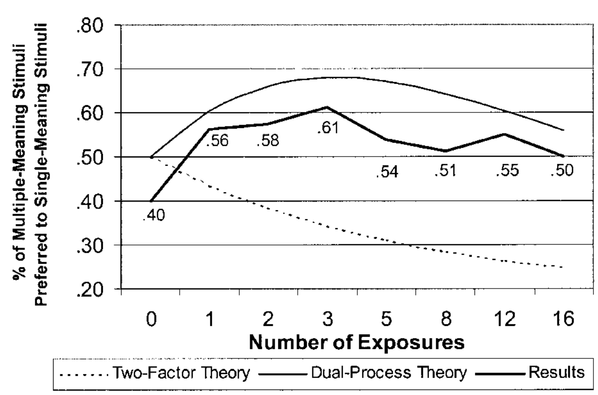
To address this alternative two-factor explanation, a second test was developed. Whereas the first experiment attempted to differentiate between the two models by manipulating the amount of learning (two-factor theory) or habituation (dual-process theory) resulting from repeated exposure to stimuli, the second experiment attempted to manipulate the amount of satiation (two-factor theory) and habituation (dual-process theory) associated with repeated exposure to stimuli. To manipulate satiation/habituation, the interval between each stimulus exposure was increased by inserting additional items. This manipulation is commonly used to reduce satiation (Berlyne 1970; Bornstein 1989) and habituation (Groves and Thompson 1970; Kaplan and Werner 1986).

The two models make competing predictions about the influence of increasing the interval between stimulus presentations. Two-factor theory predicts that increasing the interval between stimulus presentations should reduce satiation, hence the stimuli damaged by satiation should benefit the most. If the alternative two-factor explanation is correct, and people did satiate to single-meaning stimuli at higher levels of repetition, then increasing the interval between stimulus presentations should minimize satiation and allow the single-meaning stimuli to sustain their advantage at higher levels of repetition. As a consequence, the U-shaped preference curve observed in experiment 1 should become a decreasing logarithmic preference curve (see Fig. 3).

Dual-process theory predicts that increasing the interval between stimulus presentations should reduce habituation, hence the stimuli that people habituated to more quickly should benefit. In the first study, dual-process theory predicted that the multimeaning stimuli had less than twice the sensitization of the single-meaning stimuli, but more than double the habituation. Increasing the time interval between stimulus presentations should significantly reduce the habituation of both the multiple-meaning stimuli and the single-meaning stimuli during initial exposures. As a consequence, differences in preference observed during the initial exposures should depend on differences in relative sensitization. The multiple-meaning stimuli should generate more

FIGURE 3

EXPERIMENT 2 PREDICTED AND OBSERVED RESULTS: PREFERENCE FOR MULTIPLE-MEANING STIMULI OVER SINGLE-MEANING STIMULI AT DIFFERENT LEVELS OF DISTRIBUTED EXPOSURE



sensitization in the initial trials, hence they should be more preferred. As additional exposures occur, habituation should build and the advantage of the multiple-meaning stimuli should decline. Thus, the U-shaped exposure preference curve favoring the single-meaning stimuli that was observed in experiment 1 should become an inverted-U curve favoring the multiple-meaning stimuli. There should be a shift in preference from the single-meaning stimuli to the multiple-meaning stimuli during initial exposures, but a shift in preference back to the single-meaning stimuli once habituation of the multiple-meaning stimuli does occur (see Fig. 3).

EXPERIMENT 2

Experiment 2 investigated the influence of increasing the duration between stimulus presentations on the relative preference between multiple-meaning and single-meaning stimuli. The procedure was identical to the procedure used in experiment 1, except that the presentation of the 32 experimental stimuli and 32 simple filler stimuli was mixed. Exposure to a stimulus from each of eight stimulus groups (four experimental, four filler) was rotated so subjects could not be exposed to the same stimulus more often than every eighth screen. The assignment of stimuli to exposure frequency and to the single-meaning or multiple-meaning condition was random. The key dependent measure was the relative preference for multiple-meaning stimuli at a given level of exposure.

Results

Forty undergraduate students received extra credit to participate in the experiment. The results are presented in Figure 3. Choice shares for the multiple-meaning stimuli were .40 in the no exposure condition, .56 at one exposure, .58 at two exposures, .61 at three exposures, .54 at five exposures, .51 at eight exposures, .55 at 12 exposures, and .50 at 16 exposures. The alternative two-factor explanation predicted a logarithmic influence of repetition with the multiple-meaning stimuli becoming less preferred with increased exposure. The pattern of the means was opposite the predicted pattern, and the test for a logarithmic influence of repetition was not significant ($F(7, 273) = 0.18$, $MSE = .24$, $p > .10$). Dual process theory predicted a quadratic influence of repetition with the multiple-meaning stimuli becoming more preferred with initial exposures, but less preferred with increasing exposures. The test for a quadratic influence of repetition was significant ($F(7, 273) = 7.78$, $MSE = .24$, $p < .05$). People were indifferent between the single-meaning and multiple-meaning stimuli at zero exposures ($t(39) = 1.67$, $p > .10$), preferred the multiple-meaning stimuli at three exposures ($t(39) = 2.04$, $p < .05$), and were indifferent between the two types of stimuli by five exposures ($t(39) = 0.83$, $p > .10$).

Discussion

The data from experiment 2 are consistent with the predictions of dual-process theory. Dual-process theory predicted that increasing the interval between repetitions should reduce the influence of habituation on conceptual fluency and, hence, should favor stimuli that are more likely to habituate with repeated exposure. Dual-process theory predicted that people were likely to experience more habituation with the multiple-meaning stimuli, hence these stimuli were most likely to benefit from the increased duration between stimulus presentations. The data showed preference shifted toward the multiple-meaning stimuli as a consequence of the initial exposures, then back toward the single-meaning stimuli with subsequent exposures.

The results of the first two studies are interesting because they violate expectations about the influence of exposure on preference. Berlyne's popular two-factor theory predicts that single-meaning stimuli should wear out before multiple-meaning stimuli, hence multiple-meaning stimuli should benefit most from increased exposure. In fact, experiment 1 shows increased exposure benefits single-meaning stimuli more than multiple-meaning stimuli. Berlyne's two-factor theory also predicts that increasing the interval between stimulus presentations should help stimuli that are more likely to become known, and boring, first. If the stimuli used in experiment 1 are reinterpreted to be consistent with two-factor theory, and it is claimed that the single-meaning stimuli provided more opportunity for learning, and subsequent satiation, then they should also benefit more from increasing the interval between stimulus presentations. In fact, experiment 2 shows the multiple-meaning stimuli benefited more from increasing the interval between stimulus presentations.

The failure of the two-factor model to account for the results of the first two experiments should reduce our confidence in other two-factor theory predictions about how to increase conceptual fluency. For example, two-factor theory predicts that the relationship between exposure and an affective response should be more pronounced for unfamiliar (novel) brands than for familiar brands. People should experience more learning and, hence, more conceptual fluency and positive affect, with the novel stimuli, whereas they should experience more satiation and, hence, less conceptual fluency and positive affect, with the familiar stimuli. In contrast, dual-process theory predicts that exposure to familiar stimuli should generate more sensitization and less habituation, as these stimuli are likely to have more significant meaning than the novel stimuli do. Thus, compared to novel stimuli, exposure to familiar stimuli should generate more sensitization and less habituation and, hence, more conceptual fluency and positive affect.

H1a: Two-factor theory: Initial exposures to both novel and familiar meaningful stimuli should result in increasing preference for the novel relative to familiar stimuli, whereas subsequent exposures should result in decreasing preference for the novel relative to familiar stimuli.

H2a: Dual-process theory: Initial exposures to both novel and familiar meaningful stimuli should result in decreasing preference for the novel relative to familiar stimuli, whereas subsequent exposures should result in increasing preference for the novel relative to familiar stimuli.

EXPERIMENT 3

Experiment 3 investigated the influence of repeated exposure on the relative preference for novel and familiar stimuli. Twenty-four of the novel, single-meaning logos used in experiments 1 and 2 were matched with familiar logos from the same industry.[3] People received zero, one, two, three, five, or eight one-second exposures to novel and familiar logos using a massed (as in experiment 1) or distributed (as in experiment 2) stimulus exposure schedule. Subsequently, subjects were presented with pairs of novel and familiar logos from the same industry and asked to select the logo they preferred more.

Stimuli and Procedure

Stimuli were divided into eight groups of six stimuli, with four of the groups consisting of novel stimuli and four of the groups consisting of familiar stimuli. The novel stimuli were a subset of the single-meaning stimuli used in the previous two experiments. The familiar stimuli were logos, with brand names and industry descriptors, of well-known leaders in their product category.[4] The familiar logos were from product categories regularly consumed by college-aged students and included Budweiser, Domino's, Starkist, Wendy's, and so on. The matching novel and familiar logos were always assigned to the same level of repetition, although the pair could be assigned to any level of repetition for a given subject.

The stimulus presentation and test procedure were similar to the procedures used in experiments 1 and 2. The only stimulus presentation modification was that the 12 and 16 presentation stimuli were made constant. Pretesting showed that subjects were likely to make corrective attributions about familiar stimuli at the highest level of repetition. We expect that using the familiar stimuli made the differential levels of exposure more salient and, hence, the corrective attribution more likely. Including filler stimuli at 12 and 16 repetitions was an attempt to reduce these corrective attributions.

Predictions and Results

Two-factor theory predicts that preference for the novel stimuli will increase with initial exposures owing to learning, then decrease with subsequent exposures as people satiate to the stimuli (see Fig. 4, two-factor massed presentation curve). As the time between stimulus presentations increases, the amount of satiation should decline, and the novel stimuli should be able to sustain their advantage over the familiar stimuli at a greater number of repetitions (see Fig. 4, two-factor distributed presentation curve). Dual-process theory predicts preference for the novel stimuli will decrease with initial exposures, then increase with subsequent exposures. Initial presentations of the familiar stimuli should result in considerable sensitization and limited habituation relative to the novel stimuli. Additional exposures to the familiar stimuli should result in habituation, which should lead to reduced preference for the familiar stimuli (see Fig. 4, dual-process massed presentation curve). Moreover, as the time between stimulus presentations increases, the familiar stimuli should become less likely to habituate and should be able to sustain their advantage over the novel stimuli (see Fig. 4, dual-process distributed presentation curve).

Forty-eight undergraduate students received extra credit to participate in the experiment. The data are shown in Figure 4. Owing to the unusual break in the trend line at eight repetitions, the analysis was limited to the zero through five repetition conditions. The break in the trend line at eight repetitions suggests that we were not successful at discouraging corrective attributions about the familiar stimuli at this level of repetition.

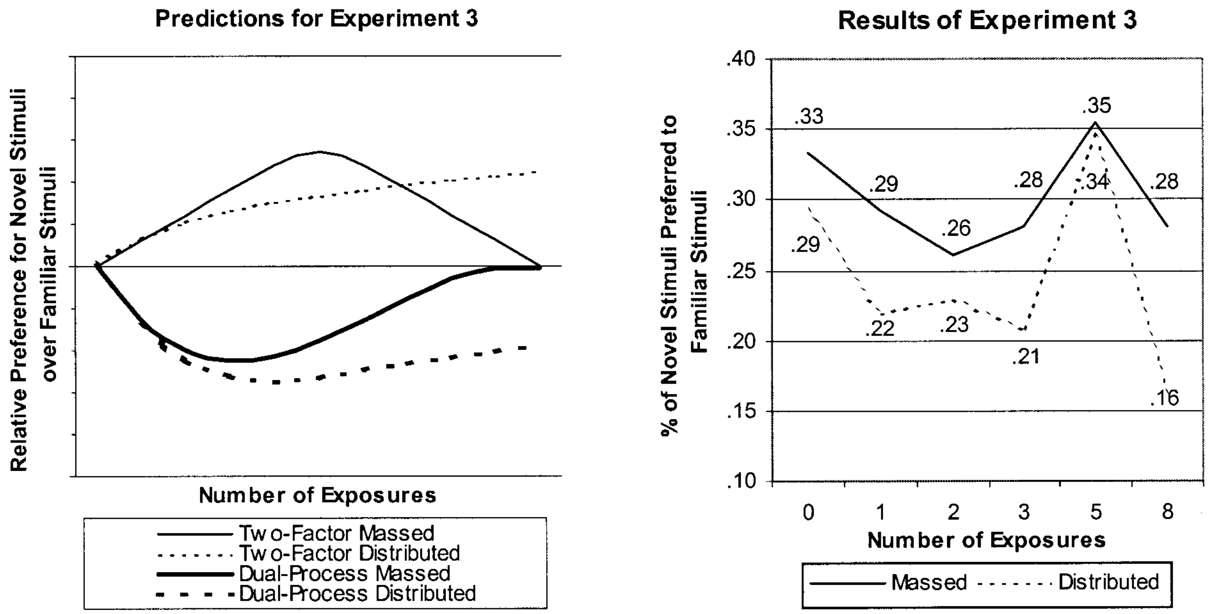
The two-factor theory and the dual-process theory predicted a quadratic influence of repetition in the massed presentation condition and a logarithmic influence of repetition in the distributed presentation condition. Choice shares for the novel stimuli in the massed condition were .33 in the no exposure condition, .29 at one exposure, .26 at two exposures, .28 at three exposures, .35 at five exposures, and .28 at eight exposures. Choice shares for the novel stimuli in the distributed condition were .29 in the no exposure condition, .22 at one exposure, .23 at two exposures, .21 at three exposures, .34 at five exposures, and .16 at eight exposures. The test for an interaction between the type of presentation schedule and a quadratic influence of repetition was not significant ($F(4, 184) = 0.25$, $MSE = .17$, $p > .05$), so the massed and distributed conditions were collapsed. The test for a quadratic influence of repetition was significant ($F(4, 184) = 6.81$, $MSE = .17$, $p < .05$). As predicted by dual-process theory, preference for the novel stimuli declined from .31 at no repetitions to .24 at two repetitions ($F(1, 183) = 2.31$, $p > .05$), although this decline was not significant. As predicted by dual-process theory, the selection of the novel stimuli as the more preferred stimulus increased significantly from .24 at two repetitions to .35 at five repetitions ($F(1, 183) = 5.81$, $p < .05$).

[3] Some of the complex logos used in experiments 1 and 2 did not have a familiar counterpart in the designated industry. For example, there are no well-known dry-dock storage or ceramic companies.

[4] A pretest showed that the average complexity of the familiar logos ($M = 3.06$) was less than the average complexity of the novel logos ($M = 4.66$; $F(1, 702) = 187.5$, $p < .01$). Given the general finding that complex stimuli show a more pronounced response curve, this suggests the familiar logos should have shown a milder response curve, as predicted by two-factor theory.

FIGURE 4

EXPERIMENT 3 PREDICTED AND OBSERVED RESULTS: PREFERENCE FOR NOVEL STIMULI OVER FAMILIAR STIMULI AT DIFFERENT LEVELS OF EXPOSURE



Discussion

The data from experiment 3 are more consistent with the predictions of dual-process theory than with those of two-factor theory. Dual-process theory predicted that repeated exposure would initially favor familiar stimuli over novel stimuli but that this advantage would eventually dissipate. People experienced more sensitization to the familiar stimuli during initial exposures and showed increasing preference for the familiar stimuli with increasing repetition. Additional exposures resulted in habituation and a reduction in preference for the familiar stimuli. Similar to experiment 2, there is no way to modify two-factor theory to account for the results.

It is surprising that the massed/distributed manipulation of the stimulus presentation format did not have an influence on the relative preferences of the respondents. One possible explanation relies on the rate of rehabituation to the familiar stimuli with each successive presentation. Every time a stimulus appears, there is some level of habituation that then dissipates when the stimulus disappears. With each additional presentation of the stimulus, prior habituation must be reinstantiated before additional habituation can occur. Groves and Thompson (1970) refer to this process as rehabituation and claim it must be faster than the initial habituation if each additional exposure is to result in additional habituation. It may be that the rate of rehabituation to any stimulus is influenced by the speed of recognition during the current presentation. Very familiar stimuli are recognized more quickly and rehabituate more quickly, hence a massed/distributed presentation manipulation has less influence on this class of stimuli (Kaplan and Werner 1986; Prescott 1998; Watts 1973). This would explain why a distributed presentation schedule would benefit unfamiliar stimuli, as in experiment 2, but not familiar stimuli, as in experiment 3.

EXPERIMENT 4

The data thus far suggest that dual-process theory is a viable explanation of how and why conceptual fluency is sensitive to stimulus characteristics, exposure frequency, and the time between stimulus exposures. If the changes in relative preference that we have observed in experiments 1–3 are mediated by changes in conceptual fluency, then these responses should have the same characteristics as fluency-based responses studied in other contexts, the most obvious being that the responses should generalize to nonaffective judgments. Thus, experiment 4 was a replication of experiment 3, but with a nonaffective dependent variable. Subjects were asked to determine which of the two brands was more expensive. It was felt that consumers often make judgments about which brand costs more, just as they often make judgments about which brand they prefer. Yet, it was unlikely that a judgment of preference would generalize to a judgment about expensiveness. Hence, if judgements about expensiveness mimicked judgments about preference, then we will have additional evidence that processing fluency is the factor influencing judgments in our studies.

Stimuli and Procedure

The stimuli were identical to the stimuli used in experiment 3. The presentation schedule was limited to the massed presentation schedule because (1) there were no differences between the two presentation schedules observed in experiment 3 and, (2) the predictions of the two theories deviate most strongly when stimuli are presented using a massed presentation schedule. The dependent measure was the phrase, "Which brand is more expensive?" followed by a 200-point sliding scale (i.e., -100 to $+100$) with the lower end point anchored by the familiar company logo and the upper end point anchored by the novel company logo.

Results

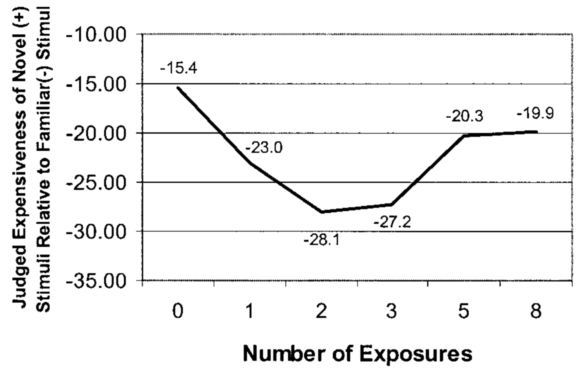
Forty-eight undergraduate students received extra credit to participate in the experiment. The data are shown in Figure 5. Ratings of relative expensiveness showed the novel brand was rated at -15.4 in the no exposure condition, -23.0 at one exposure, -28.1 at two exposures, -27.2 at three exposures, -20.3 at five exposures, and -19.9 at eight exposures. Given that the scale anchor of -100 was associated with the familiar brand being more expensive, the data showed that the familiar brand was judged as more expensive with initial increases in exposure, then less expensive after subsequent exposures. The test for the quadratic influence of repetition was significant ($F(5, 235) = 4.04$, $p = .05$). As predicted by dual-process theory, the rating of the relative expensiveness of the familiar brand increased significantly from -15.4 at zero exposures to -28.1 at two exposures ($F(1, 47) = 3.91$, $p = .05$). There was no difference between the ratings in the zero exposure ($M = -15.4$) and the eight exposure ($M = -19.9$) conditions ($F(1, 47) = 0.37$, $p > .10$).

Discussion

The data from experiment 4 replicate the data from experiment 3, but with a different dependent measure. During initial exposures to the stimuli, people were expected to experience more sensitization and less habituation with the familiar stimuli, have an increased level of conceptual fluency when viewing these stimuli, and rate them as more expensive. Additional exposures resulted in increased habituation of the familiar stimuli, a reduction in conceptual fluency, and a judgment that the brands were less expensive. It is interesting to note that the expensiveness rating in experiment 4 would seem to be conceptually different from the affective rating in experiment 3. The implication is that people are making an attribution about the conceptual fluency associated with the stimuli instead of generating an affective response per se.

FIGURE 5

EXPERIMENT 4 RESULTS: JUDGED EXPENSIVENESS OF NOVEL STIMULI RELATIVE TO FAMILIAR STIMULI AT DIFFERENT LEVELS OF EXPOSURE



GENERAL DISCUSSION

To date, the processing fluency/attribution model has not made predictions about the source of the processing fluency beyond the basic premise that more exposure leads to more fluency. The four experiments reported in this article seek to demonstrate that processing fluency is not a monotonically increasing function of the number of exposures. Instead, processing fluency is the output of a complex opponent process that depends on the sensitization and the habituation of a stimulus at any given time. These data are most consistent with the dual-process theory that predicts that the neural responsiveness to structural and semantic properties of a stimulus will lead to perceptual and conceptual fluency. In particular, we show that stimulus meaning, stimulus familiarity, and the stimulus presentation schedule will influence sensitization and habituation, which in turn will influence processing fluency and consumer judgments.

Dual-process theory and two-factor theory differ in their underlying assumptions about how people process and respond to repeated presentations of the same information. Dual-process theory assumes a passive processing system. All stimuli have a level of functional significance that determines the response to a stimulus, but this level of functional significance exists prior to exposure and is not altered by the exposure experience. In contrast, two-factor theory assumes an active processing system. People actively investigate novel stimuli in the environment in an effort to reduce uncertainty and increase comfort. Repeated stimulus exposure creates an opportunity for learning and satiation that in turn dictates the response to the stimulus. The issue is not whether these two processes exist, as they certainly must. Instead, the issue is what types of stimuli and contexts are likely to influence the use of outputs from either process.

Studies in consumer behavior provide some insight into when either process might be active. One line of research investigates the influence of repeated exposure to logos, brand names, product packages, and simple claims on subsequent judgments (Anand et al. 1988; Hawkins and Hoch 1992; Janiszewski 1988, 1993; Shapiro 1999; Shapiro et al. 1997). These studies are characterized by static stimuli that have established meanings. A second line of research investigates the influence of repeated processing of radio and television commercials (Anand and Sternthal 1990; Cacioppo and Petty 1979; Calder and Sternthal 1980; Rethans, Swasy, and Marks 1986). These studies are characterized by dynamic, multidimensional stimuli that require verbal processing, information integration, and argument assessment. Dual-process theory seems most appropriate for describing responses to the repeated exposure to static brand names, logos, and packages, whereas two-factor theory seems most appropriate for describing responses to repeated processing of commercials. In addition, dual-process theory seems more compatible with the processing fluency/attribution model that has become the accepted explanation of the exposure effect.

There are additional differences between the two-factor theory and the dual-process theory. Investigations of two-factor theory have focused on controlling boredom by manipulating the respondent's processing strategy and the stimulus presentation schedule (Calder and Sternthal 1980; Obermiller 1985). The goal has been to find the proper balance between exposure, learning, and forgetting in order to reduce boredom and wear-out. In contrast, dual-process theory predicts learning about a stimulus should be promoted without regard for boredom. Although learning does not directly influence the response curve, learning enhances the meaningfulness of the stimuli and more meaningful stimuli are less likely to habituate. Hence, logos that have significant meaning are least likely to wear out. Two-factor theory also assumes the effects of exposure are independent of context, whereas the dual-process theory assumes fluency is context bound. Dual-process theory predicts a stimulus can be made more fluent simply by surrounding it with less fluent alternatives, a finding that has consistently been observed in studies on attention (Glass and Holyoak 1986) and more recently in studies of false recognition (Whittlesea and Williams 2000).

The dual-process theory can also provide insight into recent findings on effective logo design (Henderson and Cote 1998). Henderson and Cote (1998) find that more complex and elaborate logos are better at maintaining viewer interest and liking. They also find that logos with uniformity along a single dimension are more likely to be falsely recognized and positively evaluated and that familiar logos are more liked than unfamiliar logos. It is possible that many of these observed differences can be attributed to processing fluency. More important, the dual-process model makes specific predictions about the sources of differences in preference for logos. For example, the dual-process model predicts that uniformity along a single structural dimension creates perceptual fluency and that salience achieved via high contrast could have a similar effect. The dual-process model also predicts that meaningful stimuli are more likely to be conceptually fluent. Yet, complexity is probably a spurious factor in that it should lead to perceptual fluency only if there is a single, uniform perceptual dimension and lead to conceptual fluency only if there is a consistent and significant degree of meaning.

The dual-process model can also provide insight into differences in preference when stimuli have not been repeated. One of the interesting findings in the mere exposure research is that stimuli are not rated equivalently after no exposures. Often, these differences are attributed to associations evoked by the stimulus or violations of gestalt principles of form and balance. Dual-process theory predicts that stimuli will have different levels of perceptual and conceptual fluency at the first exposure. More salient or more meaningful stimuli should generate relatively more sensitization, less habituation, and have an increased likelihood of being chosen, as is the case when a high-contrast package is used to direct attention to an alternative. Whittlesea (1993) has shown that stimulus salience, a driver of sensitization, can influence choice on the initial presentation of a stimulus. Whittlesea and Leboe (2000) show that the similarity of a current target to targets seen in the past increases fluency for the present target and increases the likelihood that it will be chosen. Thus, the fluency bias is not limited to the exposure domain.

Research Extensions

There are many challenges remaining in fluency research. First, little is known about the stimulus factors that influence perceptual and conceptual fluency. Prior research has shown that exposure is a factor and these data, along with the findings of Henderson and Cote (1998), imply that more information on a single perceptual or semantic dimension will also increase fluency. Second, little is known about how perceptual and conceptual fluency combine or compete to influence responses. To date, we are aware of no studies that attempt to manipulate perceptual and conceptual fluency in the context of a series of repeated exposures. Whittlesea (1993) shows that perceptual or conceptual fluency created at test does not interact with perceptual fluency created via exposure, but his studies are limited to a two condition (e.g., no exposure/exposure) experimental design. Third, we are just beginning to understand the influence of relative fluency on judgments. Whittlesea and Williams (2000) have shown that people have expectations (internal norms) about how fluent a stimulus should be in a given context, and it is the deviation from the expectation that is used as an input into the attribution of fluency. They call this a processing fluency discrepancy/attribution hypothesis. Whittlesea and Williams (2000) claim that norms can be established by one source of fluency (e.g., conceptual), which in turn leads to expectations about the other source of fluency (e.g., perceptual) as well as the fluency of comparative objects.

It may also be useful to assess the potential for dual-process theory to account for phenomena that have been previously explained using two-factor theory. For example, two-factor theory has been advanced as a possible account of variety seeking behavior (McAlister and Pessemier 1982; Menon and Kahn 1995; van Trijp, Hoyer, and Inman 1996). Although two-factor theory accounts for some variety seeking behavior, it has been unable to explain why people satiate to some stimuli and not to others (van Trijp et al. 1996). Explanations of differential variety seeking across product categories have been attributed to processes that are independent of two-factor theory, namely, differential product category involvement, differential hedonic value of available options, and differential levels of perceived differences between alternatives. Interestingly, all of the explanations are consistent with a dual-process prediction of differential sensitization to stimuli. In fact, the strong emphasis on pairwise brand similarity as an explanation of variety seeking is much closer to the dual-process concept of differential sensitization owing to the differential functional meaning of the stimuli than the two-factor concept of differential stimulation levels for the two stimuli. Thus, dual-process theory has the potential to provide insight into reasons consumers engage in variety seeking.

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