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THE ATTRIBUTION AND DISCOUNTING OF PERCEPTUAL FLUENCY: PRELIMINARY TESTS OF A PERCEPTUAL FLUENCY/ATTRIBUTIONAL MODEL OF THE MERE EXPOSURE EFFECT

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Bornstein and D'Agostino (1990, 1992) hypothesized that the mere exposure effect results from a combination of two processes. First, an increase in perceptual fluency is induced by repeated exposure to a stimulus. Second, subjects attribute perceptual fluency effects to liking for a stimulus based on contextual cues provided by the experimenter. This paper describes two experiments that test predictions derived from the perceptual fluency/attributional model. In Experiment 1, the availability of information that allowed subjects to attribute perceptual fluency effects to the stimulus familarization procedure resulted in lower evaluative ratings of stimuli in a typical subliminal mere exposure effect experiment. In Experiment 2, the introduction of information that discouraged subjects from attributing perceptual fluency effects to the stimulus familiarization procedure resulted in more positive evaluative ratings of stimuli in a supraliminal mere exposure effect experiment. The theoretical implications of these findings are discussed, and suggestions for future studies in this area are offered.

The idea that repeated, unreinforced exposure to a stimulus leads to more positive attitudes regarding that stimulus has had a long history in psychology (see Fechner, 1876; James, 1890; Maslow, 1937; Pepper, 1919). Zajonc (1968) reviewed much of the early evidence supporting this hypothesis, conducted several studies assessing the conditions under which repeated exposure to a stimulus leads to more positive evaluations of that stimulus, and introduced the term *mere exposure effect* to describe this phenomenon. Since the publication of Zajonc's seminal

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monograph on the mere exposure effect, there have been more than 200 published experiments testing the hypothesis that repeated, unreinforced exposure to a stimulus results in increased liking for that stimulus (Bornstein, 1989, 1992).

The mere exposure effect has proven to be a robust, reliable phenomenon. A wide variety of stimuli (e.g., nonsense words, real words, photographs, drawings, idiographs) and a number of different rating procedures (e.g., likert-type ratings, forced-choice preference judgments, behavioral indices of stimulus preference) have been employed in mere exposure effect experiments. Moreover, these experiments have been conducted in both laboratory and field settings, using a variety of stimulus exposure techniques. Although there is some variability in the magnitude of the exposure effect obtained under different conditions, a variety of stimuli and experimental procedures have been found to produce strong mere exposure effects (see Bornstein, 1989; Harrison, 1977; Stang, 1974).

One of the most interesting findings to emerge from research on the mere exposure effect concerns the relationship between subjects' awareness of the content of a stimulus and the magnitude of the exposure effect. To date, more than a dozen studies have obtained robust mere exposure effects using stimuli that could not be recalled or recognized by subjects at better-than-chance accuracy (see Bornstein, 1992 for a review of these investigations). Not only do subliminal stimuli produce robust mere exposure effects, but recent findings indicate that the magnitude of the exposure effect produced by subliminal stimuli is significantly larger than the magnitude of the exposure effect produced by stimuli that are recalled and recognized by subjects at better-than-chance accuracy. Bornstein's (1989) meta-analysis of research on the mere exposure effect found that the magnitude of the exposure effect produced by subliminally-presented stimuli was far larger than the magnitude of the exposure effect produced by briefly-presented stimuli that were clearly recognized by subjects. Although both subliminal and supraliminal stimuli reliably produce significant mere exposure effects, the magnitude of the subliminal mere exposure (SME) effect is typically about twice as great as the magnitude of the mere exposure effect produced by clearly-recognized stimuli (Bornstein, 1989, 1992).

A recent laboratory investigation of subliminal—supraliminal differences in the mere exposure effect produced results consistent with Bornstein's (1989) meta-analytic findings. In two separate experiments Bornstein and D'Agostino (1992) demonstrated that the magnitude of the SME effect exceeds the magnitude of the exposure effect that is obtained when clearly-recognized stimuli are used. Moreover, comparable subliminal—supraliminal differences were found for simple, abstract stimuli (i.e., polygons and line drawings) and more complex social stimuli (i.e., photographs of college students) in these experiments. Bornstein and D'Agostino's (1992) study represents the first direct demonstration that stimuli perceived without awareness produce significantly larger mere exposure effects than identical stimuli presented under supraliminal conditions.

Extant models of the mere exposure effect cannot easily accomodate the finding that subliminal stimuli produce larger exposure effects than clearly-recognized stimuli. In fact, the one-factor, two-factor, arousal, response competition, opponent-process and attitude formation models of the mere exposure effect all predict that stimuli perceived without awareness should produce exposure effects that are weaker than (or, at best, comparable to) those produced by stimuli that are consciously perceived (see Bornstein, 1989; and Bornstein & D'Agostino, 1992 for detailed discussions of this issue). To accomodate recent findings regarding the magnitude of the mere exposure effect produced by stimuli perceived without awareness, a theoretical account of the mere exposure effect must be able to explain two key aspects of these experiments. First, a comprehensive model of the exposure effect must account for the finding that stimuli perceived without awareness produce reliable exposure effects (Harrison, 1977; Zajonc, 1980). Second, a comprehensive model of the exposure effect must explain the process by which stimulus awareness inhibits the mere exposure effect (Bornstein & D'Agostino, 1992).

Recently, Bornstein and D'Agostino (1990, 1992) developed a theoretical account of the mere exposure effect which can accomodate recent findings regarding SME effects. This model (which we have termed the *perceptual fluency/attributional model*) was based largely on the work of Jacoby and his colleagues (e.g., Jacoby & Dallas, 1981; Jacoby & Kelley, 1987; Jacoby & Whitehouse, 1989), as well as on the theoretical and empirical work of Bargh (1989), Mandler, Nakamura and Van Zandt (1987), and Seamon, Brody and Kauff (1983a, 1983b). The basic tenets of the perceptual fluency/attributional model of the mere exposure effect are as follows.

Jacoby and his colleagues have demonstrated that repeated exposure to a stimulus facilitates subsequent perceptual-encoding processes involving that stimulus (see Jacoby, Toth, Lindsay & Debner, 1992). In other words, previously-seen stimuli are easier to perceive, encode and process than are stimuli that have never been seen before. Jacoby and his colleagues refer to this facilitation effect as an enhancement in "perceptual fluency" (Jacoby & Kelley, 1987). Although the processes which underly perceptual fluency effects have not been identified conclusively, several cognitive operations appear to be involved in the production of these effects. Specifically, recent evidence suggests that repeated exposure to a stimulus results in the formation of a perceptual representation of that stimulus, which may or may not be accessible to conscious awareness (see Mandler et al., 1987). When the previously-exposed stimulus is re-encountered at some later date, this perceptual representation is activated, which facilitates the encoding and processing of the stimulus and results in enhanced perceptual fluency for that stimulus (Jacoby et al., 1992; Jacoby & Kelley, 1987; Mandler et al., 1987; Schacter, 1987).

Recent research has confirmed that perceptual fluency effects occur effortlessly and automatically, and do not require conscious attention or controlled, strategic processing of stimulus content (Jacoby, Kelley, Brown & Jasechko, 1989a; Jacoby, Kelley & Dywan, 1989b; Jacoby & Whitehouse, 1989). Thus, perceptual fluency effects represent a kind of implicit memory for prior exposure to—and experience with—a stimulus (Jacoby et al., 1992; Kihlstrom, Barnhardt & Tataryn, 1992; Schacter, 1987). In this context, it is not surprising that stimuli perceived without awareness produce robust perceptual fluency effects (Bornstein, 1992; Kihlstrom et al., 1992; Mandler et al., 1987). Clearly, conscious awareness of stimulus exposures is not required for the production of these effects (Jacoby et al., 1989a, 1989b, 1992).

Needless to say, when asked to verbalize the experience of perceptual fluency, subjects do not report that their perceptual-encoding processes involving a previously-seen stimulus have been enhanced. Rather, subjects formulate the most parsimonious and reasonable explanation available to explain the experience of perceptual fluency, given situational constraints and the available contextual cues. Jacoby and his colleagues have demonstrated that subjects can be induced to attribute perceptual fluency effects to a variety of stimulus properties (Jacoby et al., 1992). Perceptual fluency effects may even be attributed to aspects of the experimental setting if appropriate cues are provided by the experimenter (Jacoby, Allan, Collins & Larwill, 1988).

We believe that enhanced perceptual fluency for a stimulus underlies the mere exposure effect (see also Seamon et al., 1983a, 1983b, for related discussions). In other words, we contend that in a typical mere exposure experiment repeated, unreinforced exposure to a stimulus results in an enhancement in perceptual fluency for that stimulus. Subjects are then confronted with familiarized (i.e., "fluent") and nonfamiliarized stimuli during the test phase of the study, and are asked to generate an evaluative rating of each stimulus. The familiarized and nonfamiliarized stimuli differ only in the degree to which perceptual fluency has been enhanced by repeated exposures. However, given the contextual cues provided by the experimenter, the subject will attribute these fluency effects to liking (or, for that matter, to any of a variety of stimulus properties that the subject is asked to rate; see Mandler et al., 1987).

At this point, the demand characteristics and situational constraints of typical mere exposure effect studies and SME studies diverge. In a typical mere exposure effect study, subjects are aware that they have just been exposed to the stimuli that they are about to rate, and therefore can infer that their reactions to the stimuli were influenced by prior exposure (i.e., the experimental manipulation). When subjects are aware of having been repeatedly exposed to stimuli during the familiarization phase of a mere exposure experiment, they can engage in a correction process (Gilbert, 1989; Trope, 1986), revising their initial interpretation of fluency effects. Awareness of prior stimulus exposures allows subjects to attribute perceptual fluency in part to the stimulus familiarization procedure. Subjects will therefore lower (i.e., correct) their affect ratings of the previously-exposed stimulus, and the evaluative rating that is finally produced will reflect perceptual fluency effects, an initial interpretation of these fluency effects, and a correction process whereby the initial interpretation is revised (and in this case, discounted).

In an SME study, however, perceptual fluency is enhanced by repeated exposure to a stimulus, yet the subject is unaware that stimulus exposures have taken place (Bornstein & D'Agostino, 1992; Bornstein, Leone & Galley, 1987; Kunst-Wilson & Zajonc, 1980; Seamon, Marsh & Brody, 1984). Thus, no correction of the subject's initial interpretation of fluency effects is available, and the subject—given the contextual cues provided by the experimenter—attributes fluency effects to the fact that they like the stimulus. Because no correction process is involved in generating liking ratings in SME experiments, the perceptual fluency/attributional model predicts that these experiments should produce significantly larger exposure effects than mere exposure experiments that involve clearly-recognized stimuli. This is precisely the pattern of results that has been obtained in exposure effects research thus far.

Although the perceptual fluency/attributional model was developed in part to account for recent findings regarding the SME effect (e.g., Bornstein & D'Agostino, 1992), it is important to note that this model does not suggest that a stimulus must be presented subliminally in order to produce an enhanced mere exposure effect. In fact, the perceptual fluency/attributional model hypothesizes that the key variable underlying the enhanced mere exposure effect in SME experiments is not stimulus subliminality per se, but rather the subject's lack of awareness of the relationship between stimulus exposures and subsequent affect ratings. As Bowers (1984, p. 228) noted, "determinants of thought and action that are not noticed or appreciated as such constitute unconscious influences....important determinants of thought and action can be unconscious by virtue of being perceived without being noticed." Similarly, Bargh (1992, p. 237) argued that "it makes no qualitative difference....whether the subject is aware of a stimulus event or not. What *does* matter is whether or not the individual is aware of the ways in which the stimulus is interpreted and categorized, and the influence of this awareness on subsequent processing."

As Bowers (1984) and Bargh (1992) make clear, when a subject is informed regarding the connection between exposure to a subliminal stimulus and his or her response to that stimulus, the magnitude of the experimental effect associated with that stimulus is likely to diminish. Although Bowers and Bargh do not discuss in detail the processes that underly the dimunition of subliminal effects following the introduction of information that informs the subject regarding stimulus-based effects on responding, the perceptual fluency/attributional model is quite explicit regarding this issue. As Bornstein and D'Agostino (1992) argued, providing subjects with information which permits them to attribute perceptual fluency effects to the stimulus familiarization procedure diminishes the likelihood that the subjects will attribute perceptual fluency effects solely to liking for a stimulus. Although being informed that one has had prior experience with a stimulus is not the same thing as having actually perceived the stimulus (Jacoby et al., 1992), this type of information manipulation can (and does) produce effects on responding that parallel those associated with having had previous experience with the stimulus (Bargh, 1992; Bowers, 1984; Jacoby & Kelley, 1987).

In this context, it becomes clear that the magnitude of the mere exposure effect should not only be affected by the subliminality (or recognizability) of a stimulus, but it should also be affected by subjects' awareness (or lack of awareness) of the relationship between stimulus exposures and liking ratings. In other words, the perceptual fluency/attributional model predicts that if a subject is made aware of the connection between stimulus exposures and subsequent evaluative ratings, the magnitude of the SME effect should diminish. Conversely, the perceptual fluency/attributional model predicts that if a subject in a typical (i.e., supraliminal) mere exposure effect experiment is prevented from recognizing the connection between stimulus exposures and subsequent evaluative ratings, the magnitude of the mere exposure effect should increase.

The purpose of the present research was to test these two predictions made by the perceptual fluency/attributional model. In Experiment 1 we investigated whether contextual information provided to subjects immediately prior to the rating phase of a typical SME experiment influenced subjects' liking ratings of merely-exposed stimuli in a manner consistent with predictions made by the perceptual fluency/attributional model. In Experiment 2 we investigated whether similar contextual information influenced subjects' liking ratings of clearly-recognized stimuli in a typical supraliminal mere exposure effect experiment.

EXPERIMENT 1

Subjects in Experiment 1 were exposed to repeated subliminal presentations of a series of photograph stimuli, following which they were asked to make liking ratings of these stimuli and of similar nonfamiliarized photograph stimuli. Immediately prior to the rating procedure an information manipulation was introduced that was designed to influence subjects' ability to engage in a correction process for fluency-based liking ratings. One-third of the subjects were told that all the stimuli they were about to rate were new, unfamiliar stimuli that they had not seen before (the *new* condition). One-third of the subjects were told that all the stimuli they were about to rate had just been shown to them during the stimulus familiarization procedure (the *old* condition). The remaining subjects received no information regarding the stimuli that they were about to rate (this condition represents the typical [*standard*] situation in an SME experiment). An additional group of subjects made baseline liking ratings of the photograph stimuli under conditions where no experimental manipulation had taken place.

Because subjects in a typical SME experiment are unaware that the stimuli they are asked to rate were presented during the familiarization phase of the study (Bornstein & D'Agostino, 1992; Bornstein et al., 1987; Kunst-Wilson & Zajonc, 1980), we expected that subjects in the *new* and *standard* conditions would produce similar frequency-liking functions. The key comparisons in Experiment 1 involve subjects' evaluative ratings of stimuli in the *old* condition versus their evaluative ratings of stimuli in the standard and baseline conditions. Based on the perceptual fluency/attributional model, we expected to find the following pattern of results in Experiment 1.

In the *new* and *standard* conditions, we expected that liking ratings of familiarized stimuli would be significantly more positive than liking ratings of nonfamiliarized stimuli, and would also be more positive than baseline liking ratings provided by control subjects. This is because liking ratings of familiarized stimuli in the *new* and *standard* conditions should reflect perceptual fluency effects in the absence of a correction process. However, liking ratings of familiarized stimuli in the old condition should not differ from baseline liking ratings because subjects in this condition can correct their initial fluency-based liking ratings based on the knowledge that the stimuli had been presented during the familiarization phase of the experiment. Furthermore, because subjects in this condition were explicitly informed immediately prior to making ratings that the stimuli were presented during the familiarization phase of the experiment, this information should be highly salient, and very likely to be used during the correction process. Thus, in contrast to a typical mere exposure experiment involving clearly recognized stimuli, wherein subjects' initial fluency-based liking ratings are only partially corrected (producing a moderate exposure effect), subjects' liking ratings of familiarized stimuli in the *old* condition should decline to baseline levels.

For nonfamiliarized stimuli in the *new* and *standard* conditions, we expected that liking ratings would not differ from baseline, because ratings of stimuli in these conditions should involve neither an increase in perceptual fluency nor a correction process. However, the perceptual fluency/attributional model makes an interesting prediction regarding liking ratings of nonfamiliarized stimuli in the *old* condition. These ratings should be significantly lower than baseline liking ratings, because informing subjects that the stimuli they are about to rate were presented during the familiarization phase of the experiment provides subjects with a discounting attribution which should lead them to lower an initial fluency-based liking rating. Therefore, liking ratings of nonfamiliarized stimuli in the *old* condition should be significantly below baseline levels (and significantly lower than liking ratings of familiarized stimuli in the *old* condition).

Although we hypothesize that liking ratings of stimuli in the old instructions condition should be significantly lower than liking ratings of stimuli in the standard and new conditions, it is important to note that we do not expect to find a Stimulus x Instructions Condition interaction in this experiment. Providing subjects with information which allows them to attribute perceptual fluency effects to the stimulus familiarization procedure should result in a correction process—and in lower liking ratings—for both familiarized and unfamiliarized stimuli. Thus, liking ratings of familiarized stimuli in the *old* condition will reflect perceptual fluency effects along with a correction process, whereas liking ratings of nonfamiliarized stimuli in the *old* condition will reflect a correction process in the absence of any exposure-based increases in perceptual fluency.

Thus, the central predictions for Experiment 1 can be summarized as follows. First, we hypothesized that there would be a main effect of stimulus familiarity on liking ratings, with familiar stimuli receiving more positive liking ratings than unfamiliar stimuli in all information conditions. In addition, we hypothesized that there would be a main effect of information condition on liking ratings, with ratings of stimuli in the *new* and *standard* conditions being significantly more positive than ratings of stimuli in the *old* condition. Ratings of stimuli in the *new* and *standard* conditions should not differ from each other. Finally: 1) liking ratings of familiarized stimuli in the *new* and *standard* conditions should be significantly more positive than baseline liking ratings; 2) liking ratings of nonfamiliarized stimuli in the *new* and *standard* conditions, and liking ratings of familiarized stimuli in the *old* condition should not differ from baseline levels; and 3) liking ratings of nonfamiliarized stimuli in the *old* condition should be significantly below baseline levels.

METHOD

SUBJECTS

Subjects were 80 undergraduates (48 women and 32 men) enrolled in Introductory Psychology classes at Gettysburg College, who participated in the study to fulfill a course requirement. Sixty subjects participated in the experiment proper; the other 20 subjects were used to establish baseline liking ratings of stimuli, and were not put through any experimental procedures before making ratings.

STIMULI AND APPARATUS

Stimuli were 20 black-and-white photographs of women taken from a college yearbook. All photographs depicted college-age women in a standard pose, and included the person's head and shoulders against a neutral background. Photographs were selected that were judged to be comparable in attractiveness. Stimuli were presented via a Gerbrands 3-channel tachistoscope, with exposure duration and stimulus field illumination electronically controlled.

PROCEDURE

Subjects were brought individually to a sparsely furnished laboratory room and informed that they were participating in a study of how people process visual information. Subjects were then seated at the tachistoscope while the experimenter administered standardized instructions and explained the apparatus. Subjects were told that they would be exposed to a series of briefly-presented stimuli, and that they should simply focus their attention on the cross in the center of the stimulus field and observe the stimuli. Subjects were told not to be concerned if they could not see the stimuli clearly, because some subjects were being exposed to the stimuli at very brief durations. After answering any final questions, the experimenter began stimulus presentations. Stimulus exposures were approximately 2 sec apart, with each exposure preceded by a 2 sec blank field with a focus dot in the center. Each stimulus exposure lasted 5 ms, and was followed by a 100 ms pattern mask consisting of overlapping letters and lines in various orientations placed randomly on a stimulus card. Previous studies have demonstrated that stimuli presented under these conditions cannot be recalled, recognized or discriminated from other briefly-presented stimuli at better-than-chance levels (Bornstein, 1992; Bornstein & D'Agostino, 1992).

The stimulus familiarization procedure consisted of 10 homogenous 5 ms exposures of each of 10 photograph stimuli, for a total of 100 stimulus exposures per subject. Order of stimuli was random. A given stimulus was assigned to the *familiar* condition for half the subjects, and was assigned to the *unfamiliar* condition for the remaining subjects. Total time taken to present all stimuli in Experiment 1 was approximately 5 min.

Following stimulus exposures, subjects were given a booklet containing all 20 stimuli (10 familiarized stimuli and 10 nonfamiliarized stimuli; one stimulus per page). Order of stimuli in the rating booklet was random. Subjects made a liking rating of each stimulus on a 9-point scale by circling the number on the rating scale which corresponded to their rating of the stimulus pictured on that page.

INFORMATION MANIPULATION

An information manipulation was introduced immediately prior to subjects' liking ratings by varying the instructions printed on the cover page of the rating booklet. Subjects in the standard condition (n = 20) received booklets with the following instructions:

> On the following pages a series of photographs of people is presented, along with a scale to rate how much you like the person pictured on that page. All we'd like you to do is circle the number in each rating scale that corresponds to your rating of the person pictured on that page. Remember, there are no right or wrong answers. We are only interested in your opinion of these people.

Subjects in the new condition (n = 20) received booklets with identical instructions, except that the following sentence was inserted after the first sentence in the standard instructions:

> All the photographs depict unfamiliar people that you have not seen before.

Subjects in the *old* condition (n = 20) received booklets with the following sentence inserted after the first sentence of the standard instructions:

> All the photographs depict people that you were just exposed to during the familiarization procedure a few moments ago.

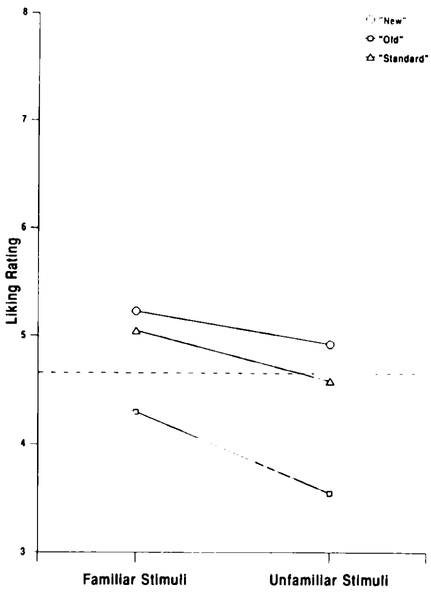

FIGURE 1. Effects of stimulus familiarity and instruction condition on liking ratings of subliminally-exposed photograph stimuli (Experiment 1). The dotted line indicates baseline liking ratings provided by control subjects (n = 20).

CONTROL SUBJECTS

Upon arriving at the laboratory, subjects assigned to the control condition received a rating booklet with standard instructions and were asked to make 9-point liking ratings of the 20 photograph stimuli.

RESULTS

The results of Experiment 1 are summarized in Figure 1. A 2x3 mixed analysis of variance (ANOVA) was used to analyze these data, with stimulus familiarity (familiar vs unfamiliar) as a within-subjects variable and instructions condition (old, new or standard) as a between-subjects variable. As predicted, this ANOVA revealed two significant main effects. There was a main effect of stimulus familiarity on liking ratings, with familiar stimuli receiving more positive ratings than unfamiliar stimuli, $F\ (1, 57) = 19.63$, $p = .0002$. There was also a main effect of information condition on liking ratings, $F\ (2, 57) = 9.55$, $p = .0005$. Follow-up t-tests confirmed that liking ratings of stimuli in the *old* condition were significantly lower than liking ratings of stimuli in the *new* and *standard* conditions, t (38) = 3.63, p = .001 for the *old—new* comparison and t (38) = 3.08, p = .001 for the *old—standard* comparison. As predicted, liking ratings of stimuli in the *new* and *standard* conditions did not differ from each other, t (38) = 0.99, NS.

Additional analyses were performed comparing liking ratings of the photograph stimuli to baseline liking ratings provided by control subjects. First, a one-way ANOVA was performed comparing liking ratings of familiar stimuli in the three instructions conditions and baseline liking ratings. This one-way ANOVA established that there were significant differences among the mean liking ratings in these four conditions, $F(3, 76) = 2.86$, $p < .05$. Follow-up t-tests revealed that familiar stimuli in the *new* condition received more positive liking ratings than stimuli in the baseline condition, $t(38) = 1.54$, $p = .06$. Liking ratings of stimuli in the *old* and *standard* conditions did not differ from baseline liking ratings (t's were 1.06 and 1.21 respectively for these comparisons).

For unfamiliar stimuli, a one-way ANOVA again revealed significant differences among the four experimental conditions, $F(3, 76) = 9.10$, p = .0001. Follow-up t-tests indicated that only liking ratings of unfamiliar stimuli in the *old* instructions condition differed significantly from baseline liking ratings, $t(38) = 3.36$, $p = .0001$. Liking ratings of stimuli in the *new* and *standard* conditions did not differ from baseline (t's were 0.90 and 0.27 respectively for these comparisons).

DISCUSSION

The results of Experiment 1 support the hypothesis that perceptual fluency effects and the availability of information that allows subjects to correct their fluency-based liking ratings combine to determine subjects' affective responses to merely-exposed stimuli. The substantial difference between liking ratings of stimuli in the *old* condition and ratings of stimuli in the *new* and *standard* conditions reflects the correction process in which subjects engage when contextual cues are available that permit them to attribute perceptual fluency to the stimulus familiarization procedure.

The comparison of liking ratings of familiarized and nonfamiliarized stimuli to liking ratings provided by subjects who had not undergone any experimental manipulations (i.e., baseline liking ratings) yielded two important findings. First, when information was made available that allowed subjects to correct (i.e., discount) fluency-based liking ratings of subliminally-presented stimuli, liking ratings of these stimuli were at baseline levels. Second, when subjects were led to believe that nonfamiliarized stimuli had been seen before, then liking ratings of these stimuli were significantly below baseline levels.

Overall, five of the six comparisons of liking ratings with baseline ratings produced results which were consistent with our *a priori* hypotheses. Although liking ratings of familiarized stimuli in the *standard* condition were in the predicted direction (i.e., were more positive than baseline liking ratings), this difference was not statistically significant. However, it is likely that the between-subjects procedure that was used to compare liking ratings in the baseline versus experimental conditions worked against our obtaining stronger effects in this comparison. As Bornstein, Kale and Cornell (1990) noted, robust mere exposure effects depend upon the familiarity manipulation being performed on a within-subjects basis. In fact, when Zajonc, Swap, Harrison and Roberts (1971) performed the stimulus familiarity manipulation on a between-subjects basis in a typical mere exposure experiment, no exposure effects whatsoever were obtained (however, see Moreland & Zajonc, 1976 for contrasting findings). In this context, the fact that between-subjects comparisons of experimental versus baseline conditions produced results that were both statistically significant and consistent with our *a priori* predictions is striking.

Although the results of Experiment 1 indicated that providing subjects with information which allowed them to attribute perceptual fluency effects to the stimulus familiarization procedure resulted in significantly lower evaluative ratings of subliminally-presented stimuli in a typical SME experiment, Experiment 1 did not address an important related question: Will information which discourages subjects from attributing perceptual fluency effects to the stimulus familiarization procedure result in an enhanced mere exposure effect for clearly-recognized stimuli? Experiment 2 was designed to address this question directly.

EXPERIMENT 2

In Experiment 1, the *old* instructions condition was designed to induce a correction process for both familiarized and nonfamiliarized stimuli presented subliminally. In contrast, the *new* instructions condition employed in Experiment 2 was designed to diminish or eliminate the correction process for those stimuli which had been presented supraliminally during the familiarization phase of the experiment. It is important to note that—unlike the *old* condition in Experiment 1—the *new* condition in Experiment 2 would not be expected to have similar effects on familiarized and nonfamiliarized stimuli. Because no correction process is involved in generating liking ratings of nonfamiliarized stimuli in a typical supraliminal mere exposure effect experiment, an information manipulation designed to diminish or eliminate the correction process should only affect subjects' ratings of familiarized stimuli. This manipulation should not affect subjects' ratings of nonfamiliarized stimuli. This leads us to predict a significant Stimulus Familiarity x Instructions Condition interaction in Experiment 2.

Subjects in Experiment 2 were exposed to a series of simple line drawings at supraliminal durations, and then were asked to make 9-point liking ratings of the familiarized stimuli and similar nonfamiliarized stimuli. An information manipulation similar to that used in Experiment 1 was used in Experiment 2. Specifically, one-third of the subjects in Experiment 2 were told that all the stimuli they were about to rate were new, unfamiliar stimuli that they had not seen before (the *new* condition). One-third of the subjects were told that all the stimuli they were about to rate had been shown to them during the stimulus familiarization procedure (the *old* condition). The remaining subjects received no information regarding the stimuli that they were about to rate (the *standard* condition). As in Experiment 1, an additional group of 20 control subjects in Experiment 2 made baseline liking ratings of the stimuli under conditions where no experimental manipulation had taken place.

Several methodological changes were introduced in this experiment in order to cause subjects to be uncertain regarding whether or not the familiarized stimuli had been seen before. First, during the stimulus familiarization procedure a large number of filler stimuli were presented. Second, stimulus exposure duration was set at 100 ms. Although 100 ms exposures result in accurate stimulus recognition by subjects in typical mere exposure experiments (Bornstein, 1992), this exposure duration is somewhat lower than the exposure duration used in most of these experiments (Bornstein, 1989; Harrison, 1977). Third, a distractor task was introduced between the familiarization and rating procedures. Finally, during the rating procedure the familiar stimuli were interspersed among a large number of unfamiliar and filler stimuli.

The central hypotheses in Experiment 2 concern the liking ratings of stimuli in the *new* and *standard* conditions. First, we hypothesized that in both the *new* and *standard* conditions, liking ratings of familiarized stimuli would be significantly more positive than liking ratings of nonfamiliarized stimuli. Moreover, because no correction process is involved in generating liking ratings of nonfamiliarized stimuli in a typical supraliminal mere exposure effect experiment, we predicted that there would be a significant Stimulus Familiarity x Instructions Condition interaction for stimuli in the *new* and *standard* conditions, with liking ratings under the *new* condition being higher than those made under the *standard* condition for familiarized stimuli, but not for nonfamiliarized stimuli.

In addition to these central hypotheses, we had several other hypotheses regarding liking ratings of stimuli in the *new* and *standard* conditions in Experiment 2. Specifically, we predicted that liking ratings of familiarized stimuli in the *new* and *standard* conditions would be more positive than baseline liking ratings provided by control subjects. This is because liking ratings of familiarized stimuli in the *new* and *standard* conditions should reflect perceptual fluency effects. Liking ratings of nonfamiliarized stimuli in the *new* and *standard* conditions should not differ from baseline liking ratings provided by control subjects.

Finally, the perceptual fluency/attributional model makes several predictions regarding liking ratings of stimuli in the *old* condition. First, liking ratings of familiarized stimuli in the *old* condition should be significantly less positive than liking ratings of familiarized stimuli in the *new* and *standard* conditions. In fact, these ratings should not differ from baseline liking ratings because subjects in the *old* condition can correct their initial fluency-based liking ratings based on the knowledge that the stimuli had been presented during the familiarization phase of the experiment. Liking ratings of nonfamiliarized stimuli in the *old* condition should be significantly lower than baseline liking ratings, and significantly lower than liking ratings of nonfamiliarized stimuli in the *new* and *standard* conditions. This is because informing subjects that the stimuli were presented during the familiarization phase of the experiment should lead subjects to lower (correct) their liking ratings of these stimuli, so that ratings of nonfamiliarized stimuli in the *old* condition should reflect discounting in the absence of an exposure-based enhancement in perceptual fluency.

METHOD

SUBJECTS

Subjects were 80 undergraduates (51 women and 29 men) enrolled in Introductory Psychology classes at Gettysburg College, who participated in the study to fulfill a course requirement. Sixty subjects participated in the experiment proper; the other 20 subjects were used to establish baseline liking ratings of stimuli, and were not put through any experimental procedures before making ratings.

MATERIALS

Test stimuli consisted of 12 simple line drawings (i.e., "Welsh figures") selected from those provided by Welsh and Barron (1949). Figures were selected that had been used successfully in previous mere exposure effect experiments (i.e., Bornstein et al., 1990; Bornstein & D'Agostino, 1992). Eighteen filler stimuli were selected from the same stimulus pool. The 12 test stimuli were randomly divided into four sets of three stimuli each. Each set of three test stimuli was used equally often as familiarized stimuli. The remaining nine test stimuli served as unfamiliar stimuli. During the stimulus familiarization procedure three test stimuli and 12 filler stimuli were presented. Liking ratings were obtained for the three familiar stimuli, the nine unfamiliar stimuli, and six additional filler stimuli.

PROCEDURE

Subjects were brought individually to a sparsely furnished laboratory room, were informed that they were participating in a study of how people process visual information, and were seated at the tachistoscope while the experimenter administered standardized instructions and explained the apparatus. After answering any final questions, the experimenter began stimulus presentations. Stimulus exposures were approximately 5 sec apart, with each exposure preceded by a 2 sec blank field with a focus dot in the center. Each stimulus exposure lasted 100 ms, and was followed by a 100 ms pattern mask.

The stimulus familiarization procedure consisted of 10 heterogenous exposures of each of 15 stimuli, for a total of 150 stimulus exposures per subject. Three of the 15 stimuli were target (i.e., test) stimuli which subjects would later be asked to rate. The remaining twelve stimuli were distractors. Order of stimulus presentations was random. Total time taken to present all stimuli in Experiment 2 was approximately 15 min.

Following stimulus exposures, each subject took part in a 10 minute "creativity test" that served as a distractor task. The creativity test items were taken from the creativity subtest of the Purdue Personnel Test (Lawshe & Harris, 1957). Creativity test items consisted of a series of five simple line drawings, with each drawing depicting an imaginary object. The subject's task was to write down as many possible uses for each object as he or she could during the 10 minute test period.

Subjects then took part in the stimulus rating phase of the experiment. During this part of the experiment subjects were seated at the tachistoscope, and were presented with one 2 sec exposure of: (1) each target stimulus from the familiarization phase of the experiment (three stimuli overall); (2) nine nonfamiliarized stimuli; and (3) six additional filler stimuli. Thus, subjects rated a total of 18 stimuli during the rating phase of the experiment. The familiarized stimuli always appeared in positions 6, 12, and 18 on the rating list, with nonfamiliarized stimuli and filler stimuli presented in random order in the other positions on the list. This ordering of stimuli was used so that: (1) subjects would always rate several nonfamiliarized and/or filler stimuli before encountering a previously-exposed stimulus; and (2) familiarized stimuli would be as distant from each other as possible on the rating list.

During the rating phase of the experiment each 2 sec stimulus exposure was followed by a 100 ms pattern mask. As in Experiment 1, subjects made a 9-point liking rating of each stimulus. However, in Experiment 2 subjects were instructed to give a verbal (rather than written) rating of each stimulus immediately after the stimulus was presented. Subjects were encouraged to make this rating as quickly as possible after a stimulus was presented.

Information Manipulation. As in Experiment 1, an information manipulation was introduced immediately prior to subjects' liking ratings. Subjects in the *standard* condition ($n = 20$) received the following instructions:

Now I'm going to show you a series of pictures. All the pictures are simple line drawings and figures. What I'd like you to do is tell me, when I show you a picture, how much you *like* the shape in that picture. We'll use a rating scale for you to let me know how much you like each picture. Here's a copy of the scale. As you can see, if you like the shape in a picture very much, you'd give it a high rating...say an 8 or a 9. If you dislike the shape in a picture very much, you might give it a 1 or a 2. If you feel less strongly, you'd rate it somewhere in the middle. As before, when I say ,"ready" a small cross will appear in the center of the screen. The picture will then appear for about 2 seconds, followed by a pattern of random letters and lines. When the letters and lines appear you should call out your rating. I'll write down your rating and we can go on to the next picture.

Subjects in the *new* condition ($n = 20$) received identical instructions, except that the following sentences were inserted after the second sentence in the standard instructions:

These pictures look a bit like the ones that you saw earlier, but they are *not* the same pictures. These are all *new* drawings taken from the same set of stimuli as that first group of pictures.

Subjects in the *old* condition ($n = 20$) received identical instructions, except that the following sentences were inserted after the second sentence in the standard instructions:

These pictures are actually the same drawings and figures that you saw earlier. In other words, these are all *old* drawings that you have seen before.

CONTROL SUBJECTS

Upon arriving at the laboratory, subjects assigned to the control condition were seated at the tachistoscope, received standard instructions for

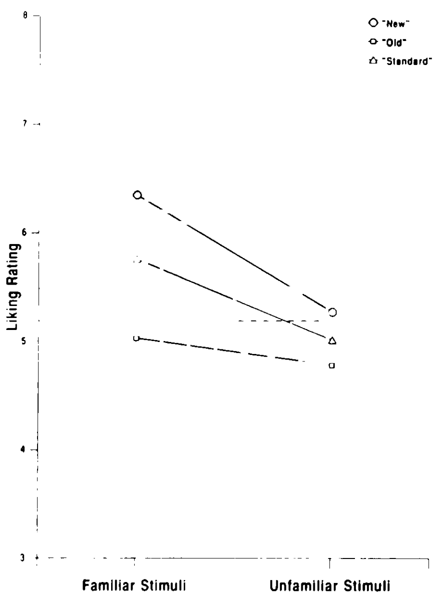

FIGURE 2. Effects of stimulus familiarity and instruction condition on liking ratings of supraliminally-exposed Welsh figure stimuli (Experiment 2). The dotted line indicates baseline liking ratings provided by control subjects (n = 20).

making liking ratings, and made 9-point liking ratings of the 12 target stimuli.

RESULTS

The results of Experiment 2 are summarized in Figure 2. A 2x3 mixed ANOVA was used to analyze these data, with stimulus familiarity (familiar vs unfamiliar) as a within-subjects variable and instructions condition (*old*, *new* or *standard*) as a between subjects variable. As predicted, there was a main effect of stimulus familiarity on liking ratings, with familiar stimuli receiving more positive liking ratings than unfamiliar stimuli, $F(1, 57) = 41.42, p < .0001$. There was also a main effect of instructions condition on liking ratings, $F(2, 57) = 5.63, p < .01$. In addition, there was a significant Stimulus Familiarity x Instructions Condition interaction for these ratings, $F(2, 57) = 5.04, p < .01$.

Tests for simple effects indicated that although liking ratings of unfamiliar stimuli in the three instructions conditions did not differ from each other, $F(2, 57) = 1.55$, NS, liking ratings of familiar stimuli in the three instructions conditions were significantly different, $F(2, 57) = 8.54$, $p < .001$. Follow-up t-tests confirmed that, as predicted, liking ratings of familiar stimuli in the *new* condition were significantly more positive than liking ratings of familiar stimuli in the *standard* condition, $t(38) = 1.97$, $p < .06$, and that liking ratings of familiar stimuli in the *standard* condition were significantly more positive than liking ratings of familiar stimuli in the *old* condition, $t(38) = 3.17$, $p < .01$.

Tests for simple effects of stimulus familiarity in the different instructions conditions (i.e., comparisons of subjects' evaluative ratings of familiarized and nonfamiliarized stimuli in the different instructions conditions) revealed significant mere exposure effects for stimuli in the *new* and *standard* conditions, $t(19) = 5.99$, $p = .001$ for *new* stimuli and $t(19) = 2.71$, $p = .02$ for *standard* stimuli. However, in the *old* instructions condition, the difference between subjects' ratings of familiarized and nonfamiliarized stimuli was not significant, $t(19) = 0.82$, NS.

Additional analyses were conducted comparing liking ratings of familiarized and nonfamiliarized stimuli to baseline liking ratings provided by control subjects. First, a one-way ANOVA was performed comparing liking ratings of unfamiliar stimuli in the three instructions conditions and baseline liking ratings. This one-way ANOVA indicated that liking ratings in these four conditions did not differ, $F(3, 76) = 1.39$, NS.

A similar one-way ANOVA was performed comparing liking ratings of familiar stimuli in the three instructions conditions and baseline liking ratings. This one-way ANOVA established that there were significant differences among the mean liking ratings in these four conditions, $F(3, 76) = 7.97$, $p < .01$. Follow-up t-tests revealed that familiar stimuli in the *new* condition received more positive liking ratings than stimuli in the baseline condition, $t(38) = 3.52$, $p < .01$. Familiar stimuli in the *standard* condition also received more positive liking ratings than stimuli in the baseline condition, $t(38) = 2.04$, $p < .05$. However, liking ratings of familiar stimuli in the *old* condition did not differ from baseline liking ratings, $t(38) = 0.52$, NS.

DISCUSSION

The results of Experiment 2 confirm that introducing information which discourages subjects from attributing perceptual fluency effects to the stimulus familiarization procedure results in more positive liking ratings of stimuli in a typical supraliminal mere exposure effect experiment. As predicted, in Experiment 2 subjects' liking ratings were higher under the *new* condition than under the *standard* condition for familiarized stimuli, but not for nonfamiliarized stimuli. These results are consistent with predictions derived from the perceptual fluency/attributional model of the mere exposure effect, and are not easily accomodated by other theoretical models (see Bornstein, 1989; Harrison, 1977).

Although the majority of results obtained in Experiment 2 were consistent with our a priori hypotheses, the finding that liking ratings of familiarized and nonfamiliarized stimuli in the *old* instructions condition did not differ from each other was unexpected. Put another way, although stimuli in the *new* and *standard* conditions produced significant mere exposure effects, stimuli in the *old* condition did not. It is possible that subjects in the *old* instructions condition did not fully correct their liking ratings of unfamiliar stimuli because there was neither recollection nor any sense of familiarity for these ostensibly "old" stimuli. In other words, for *supraliminal* stimuli complete correction of fluency-based liking ratings may require some confirming evidence that a stimulus has in fact been seen before. At any rate, despite the fact that we failed to find statistically significant differences in liking ratings of familiar and unfamiliar stimuli in the *old* instructions condition, it is important to note that these ratings were in the predicted direction, with liking ratings of familiar stimuli ($M = 5.03$) being somewhat higher than liking ratings of unfamiliar stimuli ($M = 4.78$).

As in Experiment 1, comparison of subjects' liking ratings of familiar and unfamiliar stimuli to baseline liking ratings provided by control subjects yielded several interesting results. Most important (and consistent with our a priori hypotheses), we found that: (1) liking ratings of familiar stimuli in the *new* and *standard* conditions were significantly higher than baseline liking ratings; and (2) liking ratings of unfamiliar stimuli in the *new* and *standard* conditions, and liking ratings of familiar stimuli in the *old* condition did not differ from baseline liking ratings. Although we had predicted that liking ratings of unfamiliar stimuli in the *old* condition would be significantly lower than baseline liking ratings, this prediction was not confirmed. The difference between baseline liking ratings and liking ratings of unfamiliar stimuli in the *old* instructions condition—while in the predicted direction—was not statistically significant.

GENERAL DISCUSSION

The present results support the perceptual fluency/attributional model of the mere exposure effect. Specifically, these results indicate that evaluative ratings of merely-exposed stimuli are influenced by the availability of information which allows subjects to correct their initial fluency-based ratings, as the perceptual fluency/attributional model predicts. Thus, in Experiment 1, providing subjects with information regarding the source of perceptual fluency effects resulted in lower liking ratings of stimuli in a typical SME experiment. In Experiment 2, discouraging subjects from attributing perceptual fluency effects to the stimulus familiarization procedure resulted in higher liking ratings of familiarized stimuli in a typical supraliminal mere exposure effect experiment. However, as predicted, the information manipulation used in Experiment 2 did not produce a significant increase in subjects' evaluative ratings of nonfamiliarized stimuli.

In addition to confirming some important predictions derived from Bornstein and D'Agostino's (1990, 1992) perceptual fluency/attributional model, the present results support and extend Bornstein's (1989) meta-analytic finding that "naturalistic" studies of the exposure effect, which examine evaluative ratings of stimuli present in the natural environment (e.g., fruits, flowers, common names) produce exposure effects that are more than twice as large as the exposure effects obtained in laboratory studies. Because naturalistic studies of the exposure effect do not employ any type of stimulus familiarization procedure, subjects in these studies cannot attribute fluency effects to an experimental manipulation, and therefore cannot correct their initial fluency-based liking ratings. In this respect, the present results are also consistent with previous findings demonstrating that subliminal stimuli produce substantially larger mere exposure effects than do clearly recognized stimuli (Bornstein & D'Agostino, 1992).

Although the present results support the perceptual fluency/attributional model of the mere exposure effect, these results do not represent a definitive test of the model. Clearly, some unresolved issues regarding this model remain to be addressed. For example, additional research is needed to understand more completely the nature of the correction process in which subjects engage when supraliminal stimuli are used in mere exposure effect studies. The extent to which this correction process occurs automatically and unconsciously (versus requiring conscious attention and deliberate effort on the subject's part) has not yet been examined directly. Similarly, it is not clear why subjects are motivated to correct their fluency-based liking ratings for clearly-recognized stimuli in mere exposure experiments (however, see Gilbert, 1989; Trope, 1986; and Jacoby et al., 1992 for preliminary discussions of this issue).

Although Experiments 1 and 2 both produced results that were consistent with predictions derived from Bornstein and D'Agostino's (1992) perceptual fluency/attributional model, the findings obtained in Experiment 2 are in certain respects more powerful than those obtained in Experiment 1. Most importantly, in Experiment 1 we predicted (and found) main effects for stimulus familiarity and information condition on liking ratings. While this pattern of results is consistent with the perceptual fluency/attributional model, alternative explanations for these results remain tenable. Specifically, it is possible that the main effect of instructions condition obtained in Experiment 1 resulted in part from the demand characteristics of this experiment. For example, being informed that the stimuli in Experiment 1 had been seen before might have caused subjects to perceive these stimuli as being more boring (i.e., less interesting) than would be the case under the *standard* and *new* conditions in this experiment. This would result in lower liking ratings for stimuli in the *old* instructions condition (see Bornstein et al., 1990).

Fortunately, the results obtained in Experiment 2 argue against such an explanation of our findings. The significant Stimulus Familiarity x Instructions Condition interaction in Experiment 2 not only supports the perceptual fluency/attributional model, but this pattern of results is also inconsistent with a "demand characteristic" or "instructional set" interpretation of our results. Clearly, additional research is needed to test more rigorously the central predictions made by the perceptual fluency/attributional model of the mere exposure effect. However, the present results—along with those of Bornstein & D'Agostino (1992)—offer strong preliminary support for this model.

In addition to providing preliminary support for a perceptual fluency/attributional model of the mere exposure effect, our results dovetail with recent findings by Jacoby and his colleagues regarding the parameters and properties of perceptual fluency effects (Jacoby et al., 1988, 1989a, 1989b, 1992; Jacoby & Kelley, 1987; Jacoby & Whitehouse, 1989). Consistent with the findings of Jacoby and his colleagues, our results suggest that contextual cues provided by the experimenter determine the nature of attributions made by subjects regarding perceptual fluency effects. Most important, our results confirm Jacoby et al.'s (1989a) hypothesis that subjects can be induced to attribute repetition-based perceptual fluency effects to liking for a stimulus when: 1) the source of perceptual fluency is not readily apparent; and 2) liking judgments of familiarized and nonfamiliarized stimuli are requested during the rating phase of the experiment.

Although we focused exclusively on liking ratings of merely exposed stimuli in the present study, it is important to note that the perceptual fluency/attributional model predicts that judgments regarding a variety of stimulus properties can be influenced by the combination of perceptual fluency effects and contextual cues provided by the experimenter. For example, it is likely that judgments regarding traits of a stimulus person (e.g., honesty, friendliness) could also be influenced by perceptual fluency effects, if trait judgments were called for during the rating process (see Perlman & Oskamp, 1971; and Zajonc, Markus & Wilson, 1974 for preliminary data bearing on this issue). It is not clear, however, whether fluency effects could also influence ratings of negative trait dimensions (e.g., hostility, meanness).

The question of whether the attribution of perceptual fluency is dependent upon the valence of the rating dimension is of some theoretical interest. If perceptual fluency is affectively neutral, then it should be possible to induce subjects to attribute fluency effects to both positive and negative trait dimensions, given appropriate contextual cues provided by the experimenter. If, however, research indicates that fluency effects can be obtained only for positive trait dimensions (or that fluency effects influence positive trait dimensions more strongly than negative trait dimensions), this would suggest that subjects' attributions of fluency effects are biased by affective reactions that occur early in the perceptual-encoding process (see Murphy & Zajonc, 1993 for a discussion of the role of affect in evaluative judgments of merely-exposed stimuli).

In any case, it is clear that judgments regarding a stimulus need not be affective in order to be influenced by perceptual fluency effects. Rather, perceptual fluency effects influence a range of judgments regarding a stimulus, including—but not limited to—liking judgments (Jacoby et al., 1988, 1992). Thus, it is not surprising that Mandler et al. (1987) found that repeated, unreinforced exposure to polygon stimuli influenced judgments on a variety of rating dimensions in addition to liking ratings (e.g., brightness judgments, darkness judgments). When interpreted within the context of traditional theoretical models of the exposure effect, this result was unexpected and somewhat problematic (Bornstein, 1992). This result is also inconsistent with theoretical models of the exposure effect which postulate that exposure effects represent "pure" affective responses to a stimulus (e.g., Zajonc, 1980). However, in the context of the perceptual fluency/attributional model, this result not only is readily explained, but furthermore is specifically predicted by the model (see Bornstein & D'Agostino, 1990, 1992).

A number of other predictions made by the perceptual fluency/attributional model are amenable to testing in future experiments. For example, the model predicts that variables which enhance or diminish perceptual fluency effects should influence the magnitude of the mere exposure effect. Thus, introducing procedures that interfere with stimulus encoding during the rating phase of the experiment should diminish perceptual fluency effects for merely-exposed stimuli, reducing (or even obviating) the exposure effect.

Along slightly different lines, the perceptual fluency/attributional model predicts that variables which interfere with implicit memory for a stimulus should diminish the magnitude of the SME effect (since fluency effects are diminished under these conditions), whereas variables that disrupt explicit memory for prior stimulus exposures should *increase* the magnitude of the supraliminal mere exposure effect (since in the absence of explicit memory for prior stimulus exposures subjects cannot attribute perceptual fluency effects to the stimulus familiarization procedure). Previous research on the exposure effect offers indirect support for this hypothesis. For example, increasing the delay between stimulus exposures and ratings should disrupt explicit memory for a supraliminal stimulus, and therefore should decrease the likelihood that subjects will attribute perceptual fluency effects to the stimulus familiarization procedure. Consistent with this prediction, Bornstein's (1989) meta-analytic data indicated that increasing the period of delay between stimulus exposures and ratings enhances the mere exposure effect for clearly recognized stimuli. In contrast, delay between exposures and ratings does not influence the magnitude of the SME effect, even when this delay lasts for up to two weeks (Seamon et al., 1983b).

Early theoretical models of the exposure effect focused primarily on the ways in which acquisition of conscious knowledge regarding a stimulus leads to more positive evaluations of that stimulus (see Harrison, 1977; Stang, 1974; Zajonc, 1968). Increasingly, theoretical accounts of the mere exposure effect have emphasized the ways in which conscious (i.e., explicit) and unconscious (i.e., implicit) perceptual, learning and memory processes interact to determine affect ratings of merely-exposed stimuli (see Bornstein & D'Agostino, 1992; Gordon & Holyoak, 1983; Murphy & Zajonc, 1993; Zajonc, 1980). Theoretical models which emphasize the interplay of conscious and unconscious processes as determinants of evaluative ratings of merely exposed stimuli have generated a number of interesting findings in recent years, and have contributed in important ways to our understanding of the affective and cognitive determinants of the mere exposure effect (Bornstein, 1992). Insofar as these theoretical frameworks also help to link exposure effects research to research in other areas in psychology (e.g., implicit memory research; see Jacoby et al., 1992; Schacter, 1987), recent theoretical models of the mere exposure effect may contribute to our understanding of these phenomena as well.

REFERENCES

Bargh, J. A. (1989). Conditional automaticity: Varieties of automatic influence in social perception and cognition. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 3–51). NY: Guilford Press.

Bargh, J. A. (1992). Does subliminality matter to social psychology? Awareness of the stimulus versus awareness of its influence. In R. F. Bornstein & T. S. Pittman (Eds.), *Perception without awareness: Cognitive, clinical and social perspectives* (pp. 236–255). NY: Guilford Press.

Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968-1987. *Psychological Bulletin, 106*, 265–289.

Bornstein, R. F. (1992). Subliminal mere exposure effects. In R. F. Bornstein & T. S. Pittman (Eds.), *Perception without awareness: Cognitive, clinical and social perspectives* (pp. 191–210). NY: Guilford Press.

Bornstein, R. F., & D'Agostino, P. R. (1990). *Limiting conditions on the exposure effect: Boredom and attributional discounting*. Paper presented at the 98th annual meeting of the American Psychological Association, Boston, MA; August 13.

Bornstein, R. F., & D'Agostino, P. R. (1992). Stimulus recognition and the mere exposure effect. *Journal of Personality and Social Psychology, 63*, 545–552.

Bornstein, R. F., Kale, A. R., & Cornell, K. R. (1990). Boredom as a limiting condition on the mere exposure effect. *Journal of Personality and Social Psychology, 58*, 791–800.

Bornstein, R. F., Leone, D. R., & Galley, D. J. (1987). The generalizability of subliminal mere exposure effects: Influence of stimuli perceived without awareness on social behavior. *Journal of Personality and Social Psychology, 53*, 1070–1079.

Bowers, K. S. (1984). On being unconsciously informed and influenced. In K. S. Bowers & D. Meichenbaum (Eds.), *The unconscious reconsidered* (pp. 227–272). NY: Wiley.

Fechner, G. T. (1876). *Vorschule der aesthetik*. Leipzig: Breitkopf & Hartel.

Gilbert, D. T. (1989). Thinking lightly about others: Automatic components of the social inference process. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 189–211). NY: Guilford Press.

Gordon, P. C., & Holyoak, K. J. (1983). Implicit learning and generalization of the mere exposure effect. *Journal of Personality and Social Psychology, 45*, 492–500.

Harrison, A. A. (1977). Mere exposure. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 39–83). NY: Academic Press.

Jacoby, L. L., Allan, L. G., Collins, J. C., & Larwill, L. K. (1988). Memory influences subjective experience: Noise judgments. *Journal of Experimental Psychology: Learning, Memory and Cognition, 14*, 240–247.

Jacoby, L. L., & Dallas, M. (1981). On the relationship between autobiographical memory and perceptual learning. *Journal of Experimental Psychology: General, 3*, 306–340.

Jacoby, L. L., & Kelley, C. M. (1987). Unconscious influences of memory for a prior event. *Personality and Social Psychology Bulletin, 13*, 314–336.

Jacoby, L. L., Kelley, C. M., Brown, J., & Jasechko, J. (1989a). Becoming famous overnight: Limits on the ability to avoid unconscious influences of the past. *Journal of Personality and Social Psychology, 56*, 326–338.

Jacoby, L. L., Kelley, C. M., & Dywan, J. (1989b). Memory attributions. In H. L. Roediger & F. I. M. Craik (Eds.), *Varieties of memory and consciousness* (pp. 391–422). Hillsdale, NJ: Erlbaum.

Jacoby, L. L., Toth, J. P., Lindsay, D. S., & Debner, J. A. (1992). Lectures for a layperson: Methods for revealing unconscious processes. In R. F. Bornstein & T. S. Pittman (Eds.), *Perception without awareness: Cognitive, clinical and social perspectives* (pp. 81–120). NY: Guilford Press.

Jacoby, L. L., & Whitehouse, K. (1989). An illusion of memory: False recognition influenced by unconscious perception. *Journal of Experimental Psychology: General, 118*, 126–135.

James, W. (1890). *Principles of psychology*. NY: Holt.

Kihlstrom, J. F., Barnhardt, T. M., & Tataryn, D. J. (1992). Implicit perception. In R. F. Bornstein & T. S. Pittman (Eds.), *Perception without awareness: Cognitive, clinical and social perspectives* (pp. 17–54). NY: Guilford Press.

Kunst-Wilson, W. R., & Zajonc, R. B. (1980). Affective discrimination of stimuli that cannot be recognized. *Science, 207*, 557–558.

Lawshe, C. H., & Harris, D. H. (1957). *Creativity Subtest of the Purdue Personnel Test.* West Lafayette, IN: Purdue Research Foundation.
Mandler, G., Nakamura, Y., & Van Zandt, B. J. (1987). Nonspecific effects of exposure to stimuli that cannot be recognized. *Journal of Experimental Psychology: Learning, Memory and Cognition, 13,* 646–648.
Maslow, A. H. (1937). The influence of familiarization on preference. *Journal of Experimental Psychology, 21,* 162–180.
Moreland, R. L., & Zajonc, R. B. (1976). A strong test of exposure effects. *Journal of Experimental Social Psychology, 12,* 170–179.
Murphy, S. T., & Zajonc, R. B. (1993). Affect, cognition and awareness: Affective priming with optimal and suboptimal stimulus exposures. *Journal of Personality and Social Psychology, 64,* 723–739.
Pepper, S. C. (1919). Changes in appreciation for color combinations. *Psychological Review, 26,* 389–396.
Perlman, D., & Oskamp, S. (1971). The effects of picture content and exposure frequency on evaluations of negroes and whites. *Journal of Experimental Social Psychology, 7,* 503–514.
Schacter, D. L. (1987). Implicit memory: History and current status. *Journal of Experimental Psychology: Learning, Memory and Cognition, 13,* 501–518.
Seamon, J. G., Brody, N., & Kauff, D. M. (1983a). Affective discrimination of stimuli that are not recognized: Effects of shadowing, masking and cerebral laterality. *Journal of Experimental Psychology: Learning, Memory and Cognition, 9,* 544–555.
Seamon, J. G., Brody, N., & Kauff, D. M. (1983b). Affective discrimination of stimuli that are not recognized, II: Effect of delay between study and test. *Bulletin of the Psychonomic Society, 21,* 187–189.
Seamon, J. G., Marsh, R. L., & Brody, N. (1984). Critical importance of exposure duration for affective discrimination of stimuli that are not recognized. *Journal of Experimental Psychology: Learning, Memory and Cognition, 10,* 465–469.
Stang, D. J. (1974). Methodological factors in mere exposure research. *Psychological Bulletin, 81,* 1014–1025.
Trope, Y. (1986). Identification and inferential processes in dispositional attribution. *Psychological Review, 93,* 239–257.
Welsh, G. S., & Barron, F. (1949). *Barron-Welsh Art Scale.* Palo Alto, CA: Consulting Psychologists Press.
Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology Monograph, 9* (2, Part 2), 1–27.
Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist, 35,* 151–175.
Zajonc, R. B., Markus, H., & Wilson, W. R. (1974). Exposure effects and associative learning. *Journal of Experimental Social Psychology, 10,* 248–263.
Zajonc, R. B., Swap, W. C., Harrison, A. A., & Roberts, P. (1971). Limiting conditions on the exposure effect. *Journal of Personality and Social Psychology, 18,* 384–391.