The Mere Exposure Effect: An Uncertainty Reduction Explanation Revisited

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A misattribution explanation for the mere exposure effect posits that individuals misattribute perceptual fluency to liking when they are not aware that the fluency comes from prior exposure. The uncertainty reduction explanation posits that individuals prefer stimuli that are familiar and is consistent with findings that stimuli judged old were preferred to those judged new. The present research provides evidence to support an uncertainty reduction account of the mere exposure effect. The results of Experiment 1 show that three different operationalizations of uncertainty reduction—prior exposure, subjective familiarity, and confidence—all led to enhanced affect. The results in Experiment 2 show that participants corrected their cognitive responses but not their affective responses at higher levels of exposure frequency, suggesting that misattribution may be accountable for exposure effects in cognitive judgments but not in affective judgments.

Most studies examining the effects of repetition on judgment report an enhancement in the individual's affective response after repeated exposures to a stimulus. In a seminal article, Zajonc (1968) introduced the term "mere exposure effect" to describe the positive effects of repeated, unreinforced exposures on attitude toward a target stimulus under a condition that "just makes the given stimulus accessible to the individual's perception" (p. 1). The mere exposure effect has been demonstrated across a wide range of stimuli, such as paintings, drawings, photographs, ideographs, and music, using a variety of rating procedures such as ratings of liking, pleasantness, and forced-choice preference judgments (for a review, see Bornstein, 1989a).

Although a robust mere exposure effect has been observed, a parsimonious explanation for this phenomenon is lacking (for reviews, see Bornstein, 1989a; Harrison, 1977). Recent developments in memory research offer a starting point from which an explanation of mere exposure might emerge. Research in memory distinguishes explicit memory, as characterized by conscious recollection of a past event (often indicated by recall or recognition), from implicit memory, which involves the demonstration of improved task performance resulting from prior exposure, despite the absence of explicit retrieval of the exposure episode (for reviews, see Roediger & McDermott, 1993; Schacter, 1987). For instance, exposure to a target word has been shown to benefit performance on tasks such as lexical decision (Duchek & Neely, 1989), perceptual identification (Jacoby & Dallas, 1981), picture naming (Srinivas, 1993), anagram solving (Srinivas & Roediger, 1990), and word fragment and word stem completion (Roediger, Weldon, Stadler, & Riegler, 1992). In each case, the improved performance occurs without reference to or conscious recollection of the earlier exposure episode. The performance on these tasks is thought to have benefited from an ease of perceiving the stimulus, referred to as perceptual fluency, that has been made possible by the earlier exposure (Jacoby & Dallas, 1981).

Recent research has provided evidence that the effect of enhanced affect from repetition may be the result of respondents' making affective responses based on the perceptual fluency that they experience (e.g., Bornstein & D'Agostino, 1994; Reber, Winkielman, & Schwarz, 1998; Seamon et al., 1995). Based on these investigations, two different explanations of the mere exposure effect have emerged: the misattribution model (Jacoby, Kelley, & Dywan, 1989) and the modified two-factor model (Berlyne, 1970; Bornstein, 1989a). The misattribution view posits that perceptual fluency that results from prior exposure is incorrectly attributed to the stimulus's

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PSPB, Vol. 27 No. 10, October 2001 1255-1266

being pleasing, resulting in an enhanced evaluation toward the stimulus (Bornstein & D'Agostino, 1994). In contrast, the modified two-factor model posits that individuals prefer stimuli that are familiar and predictable and that perceptual fluency reflects learning—hence, uncertainty reduction—in the absence of recognition, which leads to an increase in liking (Reber et al., 1998; Seamon et al., 1995). Theory-testing results, however, are inconclusive because data supporting both explanations have been reported (Bornstein & D'Agostino, 1994; Lee, 1994).

Misattribution

One explanation for the mere exposure effect is based on the notion that people misattribute perceptual fluency. When respondents are not aware that the fluency in the perceptual identification of the stimulus is due to prior exposure, they may attribute it to any of a number of sources, depending on the task situation. For example, Jacoby, Woloshyn, and Kelley (1989) demonstrated the false fame effect by first presenting participants with the names of some people who were not famous. After some time, the participants were presented with another list that contained the names of some famous people as well as names from the previous list and were asked to judge whether the names represented someone famous. The interesting finding was that nonfamous people whose names were presented earlier were judged to be famous. The misattribution view is that the fluency of the nonfamous names due to past exposure was misattributed to fame. Similarly, research participants have judged the presentation duration of a previously presented word to be longer (Witherspoon & Allan, 1985), the background noise accompanying a previously heard sentence to be softer (Jacoby, Allan, Collins, & Larwill, 1988), a repeated statement to be more true (Begg, Armour, & Kerr, 1985), and previously shown geometric shapes to be brighter or darker (Mandler, Nakamura, & Van Zandt, 1987).

According to the misattribution view, individuals who are aware that the stimulus has been presented earlier will correct their initial fluency-based affective ratings to reflect their true affective response toward the stimulus (Bornstein & D'Agostino, 1994). Based on this account, certain predictions on the effects of exposure, or objective familiarity (i.e., whether a stimulus has been previously presented), and recognition, or subjective familiarity (i.e., whether the individual thinks that the stimulus has been previously presented), can be made.[1] When a stimulus is old but is judged as "not presented," perceptual fluency is misattributed to the stimulus's being particularly pleasing, and liking increases. However, when a stimulus is old and recognized as "presented," perceptual fluency is appropriately attributed to prior exposure, and affective response is adjusted downward to correct for the bias; hence, there will be little or no increase in liking. In contrast, when a stimulus is new but is recognized as being presented, affect is erroneously discounted to adjust for the bias that does not exist, and liking decreases. In addition, when a stimulus is new and judged to be not presented, no perceptual fluency from prior exposure is experienced and no correction of misattributional biases is made; hence, liking is unaffected. The misattribution view thus predicts that whereas stimuli judged to be not presented are preferred to those identified as presented, those not-presented stimuli that are truly new and presented stimuli that are truly old should not be differentially preferred. These predictions are displayed in Figure 1.

To test these hypotheses, Bornstein and D'Agostino (1994) presented black-and-white photographs of women subliminally (Study 1) and simple line drawings supraliminally (Study 2) via a tachistoscope. At the time of rating, a target stimulus was either new or had been presented in a series of 10 homogeneous exposures of 5 ms each (Study 1) or in a series of 10 heterogeneous exposures of 100 ms each (Study 2). Subjective familiarity was manipulated by informing the participants that they had never seen the test stimuli before (not presented) or that they had actually seen the stimuli via the tachistoscope earlier (presented). Results of both studies are consistent with the misattribution view in that liking is more positive for old relative to new stimuli and more positive when participants were told that the stimuli were not presented rather than presented. Furthermore, liking for old-presented stimuli and new-not-presented stimuli was not significantly different from a baseline rating where neither exposure nor subjective familiarity was manipulated.

The misattribution account is also supported by other observations. Bornstein (1989b) reported meta-analytical results demonstrating that the magnitude of the mere exposure effect is inversely related to stimulus recognition accuracy. Furthermore, Bornstein and D'Agostino (1992) provided evidence that the mere exposure effect is of a larger magnitude when the stimulus is presented subliminally versus supraliminally. These results suggest that awareness of the stimulus's prior exposure led participants to engage in a correction process, thus inhibiting the mere exposure effect.

Uncertainty Reduction

An alternative explanation for the mere exposure effect is a two-factor model that allows for uncertainty reduction processes at a nonconscious level (Bornstein, 1989a). The two-factor model posits that two opposing determinants of arousal potential—positive habituation and tedium—combine to produce the observed effects

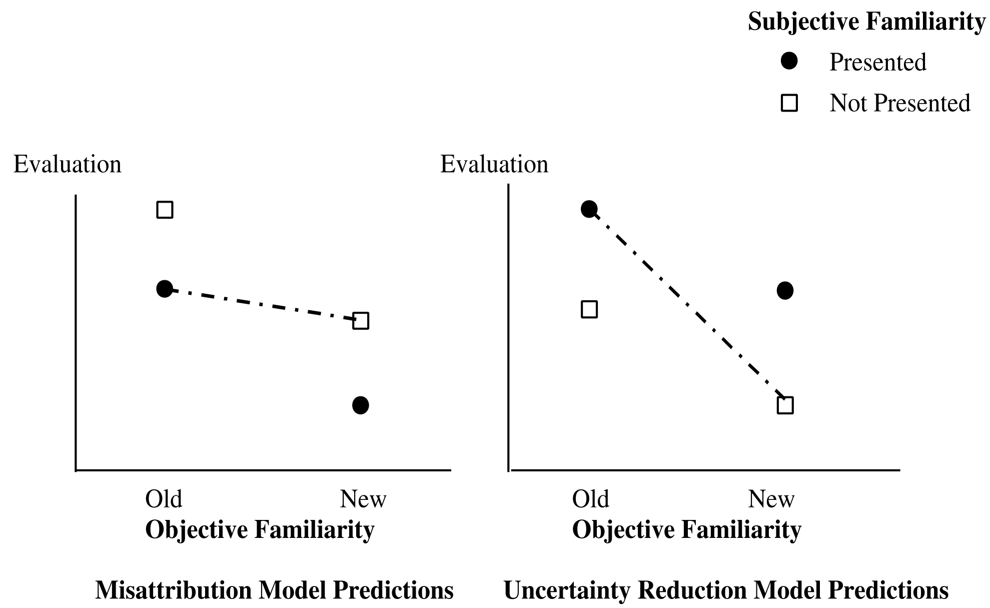

Figure 1 **Predictions of the misattribution model versus the uncertainty reduction model.**

of repetition (Berlyne, 1966, 1970). A stimulus's arousal potential is affected by its psychophysical (e.g., color), ecological (i.e., whether it is associated with positive or negative events), and collative properties (e.g., novelty), and conditions that increase a stimulus's potential arousal to a high level, such as the encountering of an unfamiliar situation or a novel stimulus, are thought to produce low levels of liking. With repeated exposures, uncertainty and conflict are reduced, and liking is enhanced. Yet, tedium also increases with exposures, which leads to a decrease in liking. The result is that affect is nonmonotonically related to the frequency of exposure (i.e., the frequency-affect curve is an inverted-U-shaped function). This two-factor explanation is consistent with most of the findings in the literature. However, the account is thought to involve processes of discrimination, categorization, and recognition and is thus at odds with findings that enhanced affect can be observed under conditions when participants' recognition of the target stimuli is no better than chance (e.g., Kunst-Wilson & Zajonc, 1980; Seamon, Brody, & Kauff, 1983).

A modified version of the model allowing for uncertainty reduction via either conscious, deliberate learning or implicit, nonconscious processing was proposed (Bornstein, 1989a). When individuals recognize a stimulus (correctly or otherwise) as one that has been previously presented, a sense of familiarity results in increased liking for the stimulus, even at times when familiarity may not be justified. Furthermore, the perceptual fluency that reflects implicit learning in the absence of recognition also contributes to uncertainty reduction and enhanced affect. This view thus predicts that old stimuli are preferred to new stimuli and stimuli thought to be presented are preferred to stimuli thought to be not presented; hence, old-presented stimuli should be most preferred, whereas new-not-presented stimuli should be least preferred. These predictions are contrasted with those of the misattribution model in Figure 1.

In a study designed to test these hypotheses, Lee (1994) used abstract patterns that resulted in chance recognition in a pretest. Similar to Bornstein and D'Agostino (1994), subjective familiarity was manipulated by informing participants that the stimuli they were about to rate were either ones they had not seen before (i.e., not presented) or ones that had been presented earlier (i.e., presented). At the time of rating, a target stimulus was either new or had been presented heterogeneously through a slide projector for three exposures of 8 seconds each. Results of this study show that old stimuli were preferred to new stimuli. Contrary to Bornstein and D'Agostino's (1994) findings, when the stimuli were old, whether participants were told that the stimuli were presented or not presented did not make a difference. However, when the stimuli were new, presented stimuli were preferred to not-presented stimuli. Furthermore, old-presented stimuli were most preferred and new-not-presented stimuli were least preferred. These data appear to be more supportive of the uncertainty reduction view than the misattribution view. This account is also consistent with Crandall's (1968) findings that a positive exposure-affect relationship was observed only in individuals who had low tolerance for ambiguity, whereas a reverse relationship was found in individuals who had high tolerance for ambiguity.

Alternative Explanations for the Conflicting Results

The misattribution account and the uncertainty reduction account propose very different cognitive processes to explain the mere exposure effect. According to the misattribution view, prior exposure does not necessarily lead to increased liking. Rather, it is the erroneous judgment that an old stimulus had not been presented that results in enhanced affect. By contrast, the uncertainty reduction account posits that enhanced affect is due to uncertainty reduction as a result of prior exposure as well as subjective familiarity.

Both Bornstein and D'Agostino (1994) and Lee (1994) report data that support an exposure effect, in which old stimuli are preferred to new stimuli. The studies differ in their findings related to the subjective familiarity effect. Information that the stimuli had been presented earlier led to less favorable affective response in the Bornstein and D'Agostino (1994) studies but to more favorable response in the Lee (1994) study. Results showing a significant subjective familiarity effect suggest that the participants in both studies were sensitive to the subjective familiarity manipulation and responded to the instructions provided by the experimenters by adjusting their affective ratings of the stimuli; however, they were adjusting their ratings in the opposite direction. One possible explanation for this opposite pattern of findings may be due to participants' generating different hypotheses with regard to the information provided by the experimenter on the prior exposure status of the stimuli. Participants in the Bornstein and D'Agostino (1994) studies were exposed to the stimuli only briefly and hence might not have been consciously aware of the stimuli being presented. In the absence of any conscious awareness of prior exposure, when informed by the experimenter that the stimuli had not been presented earlier, they might have interpreted the novelty of the stimuli as something that particularly interested the experimenter ("Otherwise why bother telling the obvious?") and rated the not-presented stimuli higher. Alternatively, when informed that the stimuli had been presented earlier even though they were not consciously aware of the exposures, they might have been concerned about being subjected to nonconscious influence (e.g., "Would my judgment be influenced?") and hence adjusted their initial ratings downward for the presented stimuli. By contrast, participants in the Lee (1994) study, who were aware of the stimuli exposures and the stimuli's difficult-to-recognize characteristic, might not have interpreted the prior exposure information as an important part of the experiment and relied more on their intuition (such as, "I prefer familiar things") to evaluate the stimuli.

TABLE 1: The Effects of Objective and Subjective Familiarity on Affective Response (a review of past studies)

Experiment	*Hit*	*Miss*	*False Alarm*	*Correct Rejection*
Anand and Sternthal (1991)				
Experiment 1	5.26	3.95	4.73	3.41
Experiment 2	5.26	3.41	4.59	3.22
Experiment 3	5.32	3.40	5.15	3.53
Matlin (1971)[a]	4.90	4.20	4.20	3.90
Obermiller (1985)	13.20	12.00	12.20	12.20
Wilson (1975)[a]	4.20	4.03	3.75	3.07
Wilson (1979)				
Experiment 1	4.16	4.11	3.33	3.19
Experiment 2	3.61	3.87	3.08	3.03

NOTE: A higher number denotes higher affective response. Hit = stimulus is old and identified as presented, Miss = stimulus is old but identified as not presented, False Alarm = stimulus is new but identified as presented, and Correct Rejection = stimulus is new and identified as not presented.
a. As reported in Zajonc (1980).

The possibility that the prior exposure status information coupled with the procedure of the exposures might affect the way that participants adjust their affective ratings casts doubts on the validity of the subjective familiarity manipulation in both studies. Indeed, the subjective familiarity resulting from the participants' being informed that they had (not) seen the stimuli earlier may be very different from their own judgment that they had indeed (not) seen the stimuli earlier. Because the construct of interest is the participants' own sense of prior encounter of the stimuli, it would be useful to examine participants' self-reported recognition judgment.

A review of past mere exposure research examining the effects of recognition on affect shows findings at odds with the misattribution view (see Table 1). Specifically, liking for "hits" are consistently rated higher than "correct rejections." Furthermore, when the stimuli are old, hits are preferred to "misses" (with the exception of Wilson, 1979, Study 2), and when the stimuli are new, "false alarms" are preferred to correct rejections (with the exception of Obermiller, 1985). By contrast, the uncertainty reduction view accurately predicts the outcomes shown in Table 1, that hits and false alarms are preferred to misses and correct rejections. In particular, hits are preferred to correct rejections.

However, before discounting the misattribution view as a viable explanation for the mere exposure effect, it is important to note that the procedure of requesting participants to engage in a recognition task in these studies introduces a source of variance that should be accounted for when interpreting the results. In most of these studies, the procedures were calibrated so that recognition was at or near chance level. With stimuli that are difficult to recognize, participants are likely to be guessing rather than relying on the conscious recollection of prior encounter as the basis of their response. The confidence that participants have in their recognition judgment may therefore affect their sense of uncertainty associated with the stimulus, which in turn would influence their affective response toward the stimulus. The hypothesis is that the less confident participants are in their recognition judgment, the higher is the level of uncertainty related to the stimulus and the less favorable would be their affective response. Thus, enhanced affective response observed in these mere exposure studies may be the result of two kinds of uncertainty reduction. The first is the result of familiarity that reflects a change in the collative dimension of the stimulus's arousal potential, whereas the second is the result of confidence in a related task and reflects a change in the ecological dimension of the stimulus's arousal potential (Berlyne, 1970).

Whereas affect may be influenced by confidence, research results suggest that there is little correlation between judgment confidence and accuracy, and participants often express extreme confidence in answers that are incorrect (e.g., Bothwell, Brigham, & Deffenbacher, 1987; Fischhoff, Slovic, & Lichtenstein, 1977). Furthermore, they are also more confident in responses associated with affirming evidence than in those that support negation (Koriat, Lichtenstein, & Fischhoff, 1980), even though these responses may not be accurate. Thus, stimuli judged to be presented are more likely to be associated with higher levels of confidence than those judged to be not presented and hence are preferred. The positive subjective familiarity effect observed may, therefore, have been mediated by confidence.

If the subjective familiarity effect is mediated by confidence, then the results reported in past mere exposure studies cannot be used to rule out a misattribution explanation. Participants may indeed have attributed perceptual fluency to liking toward stimuli judged to be not presented while correcting their fluency-based affective response for stimuli judged to be presented. However, the positive impact that arose from their confidence may have been strong enough to more than compensate for the downward correction of their liking rating, resulting in presented stimuli's being rated more favorably.

EXPERIMENT 1

The purpose of the present experiment is threefold. One objective is to test the predictions of the misattribution view versus the uncertainty reduction view using the participants' recognition response as the indicator of subjective familiarity. Findings that misses and correct rejections are preferred to the hits and false alarms would be supportive of a misattribution explanation. By contrast, findings showing that subjectively familiar stimuli are preferred to unfamiliar stimuli and that correctly identified old stimuli (hits) are preferred to correctly identified new stimuli (correct rejections) would be supportive of an uncertainty reduction explanation. The second objective is to examine the effect of confidence on affect. An uncertainty reduction view predicts that those stimuli that participants could more confidently judge would be more favorably rated, whereas those stimuli the recognition of which was based on guessing would be evaluated less favorably. Results showing a significant effect of confidence would be consistent with a general affective model of uncertainty reduction. Finally, mediational analyses would be conducted to investigate if any subjective familiarity effect observed might be mediated by confidence. A positive subjective familiarity effect that is independent of the effect of confidence would provide strong evidence that the mere exposure effect is not the result of misattribution.

Method

Participants. Seventy-two undergraduate students participated in the experiment and were given partial course credit for participation; 41 participants from the same subject pool served as the control group. All participants were randomly assigned to different conditions and were run in sessions of 2 to 6 people.

Materials. The stimuli were 24 abstract patterns generated by the Gauss program; 12 patterns were made up of 1,500 randomly distributed squares and the remaining 12 were made up of 1,500 randomly distributed triangles. Two square patterns and two triangle patterns were then randomly selected to serve as target stimuli, and the rest were used as fillers. The results of a pretest showed that recognition for these patterns was at chance level (P[Rn] = 0.5; $n = 31$).

Two lists (List A and List B) that consist of 25 exposures each were compiled. List A contained the two target square patterns repeated three times and eight filler patterns (three squares and five triangles) repeated either two or three times, resulting in a total of 25 exposures. List B contained the two triangle target patterns repeated three times and eight filler patterns (three triangles and five squares) repeated either two or three times. The sequence of exposures was randomized with the condition that there would be no consecutive presentations of the same pattern. Half of the participants in both the main study and control group saw List A at the time of exposure, and the remaining half saw List B. During the test phase, participants were presented with all four target patterns (with two being old and the other two being new) and four new filler patterns (two squares and two triangles).

Procedure. Participants were presented with a list of 25 patterns at the rate of 8 seconds per exposure and were asked to indicate whether the patterns were made up of squares or triangles during each exposure. At the end of the study phase, participants were engaged in a distractor task that involved solving some arithmetic problems for 5 minutes. At the time of rating, all participants were presented with four filler and four target patterns at the rate of 10 seconds each. The order of presentation of these patterns was randomized.

Participants in the main study were asked to rate each pattern on a 7-point bipolar liking scale (ranging from –3 to +3) anchored by *dislike very much* and *like very much*. They also were asked to indicate whether they thought the pattern had been previously presented by circling either "yes" or "no" in the answer booklet. This recognition judgment was followed by a confidence rating on the judgment, whereby participants indicated their confidence by circling either *sure*, *half-sure*, or *guessing*. Participants rated each pattern on liking as well as on recognition and confidence before moving on to the next pattern. The task order of affective evaluation and recognition-confidence rating was counterbalanced. Participants in the control condition were asked to rate the patterns on the liking scale only.

Results

Preliminary analyses. The affective responses of those participants in the control group were first examined. The data were analyzed using a 2 (exposure) × 2 (study list) ANOVA with exposure being a within-participant factor averaged over the two new and two old target stimuli and study list being a between-participant factor. The results showed a main effect of exposure, as expected. Participants preferred old patterns to new patterns (*M*s = 0.41 vs. –0.55), $F(1, 39) = 20.48$, $p < .001$, demonstrating the classic mere exposure effect. The interaction between study list and exposure was also significant, $F(1, 39) = 71.35$, $p < .001$. For those participants who saw List B, old stimuli were indeed preferred to new stimuli (*M*s = 1.23 vs. –1.55), $F(1, 19) = 70.11$, $p < .001$. However, for those participants who saw List A, old stimuli seemed to be less preferred (*M*s = –0.36 vs. 0.41), $F(1, 20) = 8.61$, $p < .01$. A closer examination of the data suggests that the interaction is due to the fact that the triangle patterns were in general preferred over the square patterns, such that triangle patterns, even when new, were preferred to square patterns that were old. When the exposure effect for triangle and square patterns is examined separately as a between-participant factor, old triangles ($M = 1.23$) were preferred to new triangles ($M = 0.41$), $F(1, 39) = 8.52$, $p = .006$, and old squares ($M = -0.36$) were preferred to new squares ($M = -1.55$), $F(1, 39) = 10.93$, $p = .002$.

Next, participants' recognition responses in the main study were examined to assess whether recognition performance was at chance level. Data for the four target stimuli from those participants whose tasks included a recognition judgment were entered into the analyses ($n = 288$). Although the patterns were more likely to be classified as familiar ($n = 157$) than unfamiliar ($n = 131$), this difference was not significant, $\chi^2(1) = 2.35$, $p > .10$. Overall, participants' recognition performance was found to be no better than at a chance level (P[Rn] = .45; $n = 288$).

The effect of task order also was examined. The results of a 2 (exposure) × 2 (task order) ANOVA using exposure as a within-participant factor and task order as a between-participant factor showed that the main effect of task order was not significant, $F < 1$; the interaction between task order and exposure, $F(1, 70) = 1.08$, $p > .30$, was also not significant. Whether participants rated the pattern on liking first and then made a recognition judgment or vice versa did not make any difference. Participants from both groups were thus combined for further analyses.

Objective and subjective familiarity effect. Both the misattribution view and uncertainty reduction view predict a main effect of objective familiarity in that old patterns are preferred to new patterns (see Figure 1). Both views also predict a main effect of subjective familiarity, but in the opposite direction. The results of a regression analysis[2] examining the effects of exposure (old vs. new), subjective familiarity (presented vs. not presented), and pattern (triangles vs. squares) showed a significant pattern effect, $t(280) = 6.95$, $p < .001$, in that triangle patterns were preferred to square patterns, and a significant subjective familiarity effect; $b = .17$, $t(280) = 1.97$, $p = .05$. No other effects were significant. Unlike those participants in the control condition who preferred old stimuli to new stimuli, participants who engaged in a concurrent recognition task did not reliably favor old stimuli ($M = 0.17$) to new stimuli ($M = -0.06$), $b = .11$, $t(280) = 1.26$, $p > .20$. However, stimuli judged to be presented ($M = 0.20$) were rated more favorably than ones thought to be not presented ($M = -0.12$). Follow-up contrast showed that hits ($M = 0.27$) were preferred to correct rejections ($M = -0.36$), $t(127) = 2.28$, $p < .05$. These results are consistent with the uncertainty reduction view and not the misattribution view.

Confidence. Confidence rating was coded such that a higher number reflects higher levels of confidence (1 = *guessing*, 2 = *half sure*, and 3 = *sure*). Participants' confidence ratings indicated that they were confident of their recognition judgment only 37.5% of the time (i.e., there were 108 *sure* responses out of a total of 288 judgments).

TABLE 2: Experiment 1: Affective Response as a Function of Objective Familiarity, Subjective Familiarity, and Confidence

Objective Familiarity and Confidence	*Subjective Familiarity* Familiar	Unfamiliar	*Mean*
Old patterns			
Sure	0.65 (n = 31)	0.41 (n = 17)	0.56
Half-sure	0.22 (n = 32)	0.08 (n = 36)	0.15
Guessing	–1.00 (n = 8)	–0.25 (n = 20)	–0.46
Mean	0.27	0.07	
New patterns			
Sure	0.36 (n = 47)	0.46 (n = 13)	0.38
Half-sure	–0.09 (n = 32)	–0.39 (n = 23)	–0.22
Guessing	–0.14 (n = 7)	–0.82 (n = 22)	–0.66
Mean	0.15	–0.36	

NOTE: Higher numbers indicate more favorable ratings.

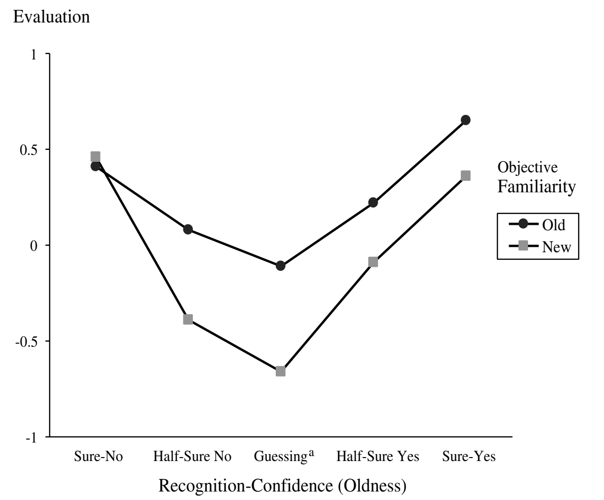

Figure 2 Experiment 1: Affective response as a function of objective familiarity and oldness.
a. Data for guessing-no and guessing-yes are combined because most of the guessing responses are "no."

This suggests that substantial uncertainty was associated with the recognition task. Furthermore, participants were no more confident in their judgment when they were correct (i.e., for hits and correct rejections; M = 2.11) than when they were incorrect (i.e., for misses and false alarms; M = 2.23), $t(286) = 1.42$, $p > .10$. However, participants were more confident when they judged the patterns to be presented (M = 2.4) relative to when they judged the patterns to be not presented (M = 1.91); b = .25, $t(286) = 5.98$, $p < .001$, even though their recognition performance was no better than chance (only 49% of old stimuli and 40% of new stimuli were correctly classified).

The effect of confidence on affect was examined next by including confidence in the regression model as a predictor. As predicted, the effect of confidence was significant, b = .37, $t(272) = 2.94$, $p < .005$. Participants rated more favorably those stimuli that they could more confidently judge. Interestingly, the effect of subjective familiarity that was significant when confidence was not included in the model became nonsignificant, $t < 1$, whereas the main effect of pattern remained significant, $t(272) = 2.37$, $p < .05$. The three-way interaction between confidence, exposure, and subjective familiarity was also significant, $t(274) = 2.09$, $p < .05$. No other effects were significant. Participants' affective response as a function of objective familiarity, subjective familiarity, and confidence are displayed in Table 2.

Following Wilson (1979), confidence and subjective familiarity ratings were combined to form an "oldness" score (oldness is coded from the recognition-confidence data such that –5 = *sure-no*, –3 = *half sure-no*, –1 = *guessing-no*, +1 = *guessing-yes*, +3 = *half sure-yes*, and +5 = *sure-yes*). As consistent with Wilson's finding, affect and oldness were not correlated (r = .09, $p > .20$); however, the correlation between affect and the quadratic term of "oldness" (i.e., a proxy for confidence) was significant (r = .25, $p < .001$). As can be seen in Figure 2, a U-shaped relationship between oldness and affect is demonstrated by the data in which liking declines from sure-no (M = 0.43) to guessing (M = –0.56), $t(281) = 2.24$, $p < .03$, and rises from guessing to sure-yes (M = 0.47), $t(281) = 3.41$, $p < .001$.

Mediational analyses conducted to examine the role of confidence showed that all three conditions necessary to establish mediation are satisfied (Baron & Kenny, 1986): Subjective familiarity has a significant effect on confidence, b = .49, $t(284) = 5.96$, $p < .001$, and a significant effect on liking, b = .35, $t(284) = 2.08$, $p < .05$. However, when both subjective familiarity and confidence are included in the model as predictors, the effect of confidence was significant, b = .37, $t(283) = 3.09$, $p < .005$, whereas the subjective familiarity effect on liking became nonsignificant, b = .17, $t < 1$. These results showed that the effect of subjective familiarity on affect was indeed mediated by confidence.

Discussion

The present results add to our knowledge that a recognition task may moderate the mere exposure effect and that confidence is positively correlated with liking. These results seem to support an uncertainty reduction view for enhanced affect. However, although participants preferred stimuli that they thought had been presented earlier, even when the stimuli were new, attempts to evaluate the two rival explanations based on their predictive capabilities regarding the subjective familiarity effect remain inconclusive. One might argue that the correction of the misattribution effect was overwhelmed by a strong confidence effect; hence, the prediction of the misattribution view that not-presented stimuli are preferred to presented stimuli was not observed. It is thus necessary to seek further evidence elsewhere.

Processes underlying misattribution have been widely investigated, and many judgments are shown to be the result of misattributions and biases (e.g., Berkowitz & Troccoli, 1990; Cantor, Bryant, & Zillmann, 1974; Greenwald & Banaji, 1995; Losch & Cacioppo, 1990; Tesser, Pilkington, & McIntosh, 1989; Zanna & Cooper, 1974). Many studies have also shown that people correct their misattributed responses when they become aware of the source of the bias (e.g., Lombardi, Higgins, & Bargh, 1987; Petty & Wegener, 1993; Reisenzein & Gattinger, 1982; Schwarz & Clore, 1983; Strack, Schwarz, Bless, Kuebler, & Waenke, 1993).

According to the misattribution view, awareness of prior exposures reduces the fluency-based bias. As awareness of prior exposures increases with repetition, enhanced affect as a result of misattribution should, therefore, diminish with repetition. Yet this result has not been observed. Instead, enhanced affect is often reported to increase with repetition (e.g., Moreland & Zajonc, 1976), and the mere exposure effect is evidenced even when participants are aware that the stimuli have been previously presented (e.g., Krugman & Hartley, 1960; Seamon, Marsh, & Brody, 1984). Bornstein, Leone, and Galley (1987, Study 2), for example, found that affective responses became more favorable with improved recognition performance as the result of increased exposure duration.

These findings suggest that misattribution may not be a good candidate to account for the mere exposure effect. This, however, is not to suggest that misattribution of perceptual fluency does not occur. Implicit memory research offers compelling evidence that perceptual fluency is often misattributed to other characteristics of the previously presented stimuli (e.g., Jacoby et al., 1988; Mandler et al., 1987; Witherspoon & Allan, 1985). In these studies, participants were often asked to make judgments on certain characteristics of the stimulus, such as loudness, brightness, clarity, and so forth. Notice that performance of these judgments often relies on processes of detection and discrimination, and performance accuracy can be evaluated on the basis of some objective measures. In making judgments that can be verified objectively, participants may feel a need to recruit evidence on which to base their response, and perceptual fluency is often recruited as the basis on which judgments are made. However, when the source of perceptual fluency is known, the likelihood of misattribution should be reduced. Indeed, evidence consistent with this notion has been reported. Whittlesea, Jacoby, and Girard (1990), for instance, manipulated the clarity of the stimulus as presented on the computer monitor and found that participants made recognition judgment based on the visual clarity of the stimulus. However, participants corrected their judgment when the clarity manipulation was made known to them.

With affective evaluations, performance need not and cannot be verified through objective measures; hence, participants would not be searching for a basis for their response. Indeed, familiarity may well be the basis on which affective responses are made (i.e., people prefer things that are familiar and easy to process), and participants would have no need to correct their responses even when they become aware of the source of the perceptual fluency. Consistent with the notion that cognitive and affective judgments rely on different processes, Mandler et al. (1987) reported that participants were more likely to select the old stimulus when asked which of two stimuli was brighter as well as when asked which was darker. Yet, participants were only more likely to select the old stimulus when asked which one they liked better, not which one they disliked more. Evidence showing participants correcting their cognitive but not affective responses with repetition should thus provide support that the mere exposure effect is not driven by misattribution.

EXPERIMENT 2

The purpose of Experiment 2 is to investigate if people rely on different processes when making cognitive judgments regarding some psychophysical dimensions of a stimulus versus making affective judgments about the same stimulus. When asked to make a judgment about some ambiguous physical properties of a stimulus, participants may initially misattribute perceptual fluency as the basis of their judgment. As exposure frequency increases, they may become aware that the perceptual fluency they experience is the result of prior exposures, in which case they would adjust their response to correct for the misattributional bias. If the mere exposure effect reflects a similar process of misattribution, then a parallel pattern of correction should be observed for affective judgments. However, if the mere exposure effect is the result of uncertainty reduction, then affective ratings should be further enhanced as exposure frequency increases (at least until boredom sets in).

Method

Participants. Fifty-four undergraduate students were paid $8 each for participating in this experiment. Participants were tested individually.

Materials. The target stimuli were 40 abstract patterns generated by the Gauss program. Each pattern was made up of 1,500 randomly distributed triangles. The 40 target patterns were randomly divided into four blocks of 10 patterns each (Blocks 1, 2, 3, and 4) such that each block was presented to a participant either zero, one, three, or six times. At the time of the study, each participant saw 140 exposures, 40 of which were filler patterns made up of little squares, and the remaining 100 exposures were 10 target patterns presented once, 10 target patterns presented three times, and 10 target patterns presented six times. The 140 exposures were randomized with the constraint that the same pattern would not be presented consecutively. Across all participants, each target pattern was presented either zero, one, three, or six times with approximately equal frequency.

Two test lists were created by first randomly dividing the 10 target patterns in each of the four blocks into two subblocks. A test list was thus made up of target patterns from four subblocks. Each target pattern was then paired with a new but comparable foil pattern made up of little triangles. Ten filler pattern pairs made up of little squares were also included in the test lists to add variety to the exposures to help ward off boredom. At the time of the test, each participant was presented with two lists of 30 (20 target and 10 filler) pairs of patterns, with each pair of patterns presented side by side on the screen. Of the 20 target patterns in each test list, 5 had not been presented earlier, 5 had been presented once, 5 had been presented three times, and 5 had been presented six times. The location of the target patterns was randomized across trials with the condition that half of the target patterns appeared as the left member of the pair and the remaining half appeared as the right member of the pair. The left-right position of each target pattern was counterbalanced across all participants. All participants were asked to make affective judgments on one list and cognitive judgments on the other. Across all participants, each test list was presented for affective judgments and cognitive judgments an equal number of times.

Procedure. Participants were informed that they were participating in a pattern perception study. They were told that they would be shown some abstract patterns made up of either little squares or little triangles and their task was to count how many of those patterns were made up of little triangles. Each pattern appeared on the screen for 1 s, with the next pattern appearing after an interval of 1 s. At the end of the study phase, participants were instructed to type in a number that represented how many patterns of triangles had been presented. Participants were then engaged in a distractor task that involved solving some arithmetic problems for 10 min. During the test phase, participants were first presented with 30 pairs of pattern and were asked to select the pattern they liked better by clicking on the pattern. Then they were presented with a second list of patterns and were asked to indicate which of the pair contained more triangles (or more squares) by clicking on the pattern. Because boredom has been found to influence affective responses in a systematic manner (Bornstein 1989a), all participants were asked to perform the affective task first, followed by the cognitive task to minimize the probability that task boredom might moderate the effect of exposure on their affective responses.

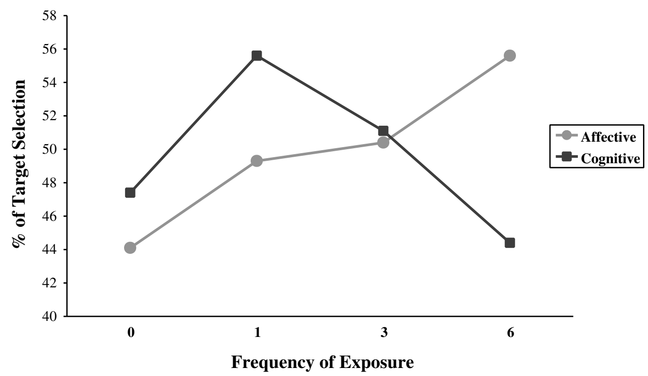

Figure 3 **Experiment 2: Cognitive and affective responses as a function of exposure frequency.**

Results and Discussion

Participants' pattern density as well as preference responses were analyzed in a 4 × 2 repeated-measures ANOVA with both exposure frequency and task as within-subject factors. If both density and preference responses are the result of misattribution of perceptual fluency, participants should correct their responses as they become aware of the potential biasing influence of prior exposures, and target patterns should be selected less often at higher levels of exposure for both tasks. Conversely, if misattribution drives only the density judgments but not the preference judgments, then we should observe participants correcting for their density judgments at higher levels of exposure but not their affective responses.

The results showed that the main effect of exposure frequency was not significant, $F(3, 159) = 1.97$, $p > .10$, and neither was the main effect of judgment task, $F < 1$. However, central to our hypothesis, the interaction between exposure frequency and task was significant, $F(3, 159) = 3.39$, $p < .05$. Separate analyses for the two judgment tasks were conducted. Target pattern selection as a function of exposure frequency and task is displayed in Figure 3.

Cognitive judgment. The results of a repeated-measures ANOVA on the density data showed that the effect of exposure frequency was significant, $F(3, 159) = 2.66$, $p < .05$. Consistent with the misattribution view, the data showed a significant quadratic trend in the relationship between selection and frequency of exposure, $F(1, 53) = 5.64$, $p < .05$, whereas the linear trend is not significant, $F(1, 53) = 1.13$, $p > .20$. Relative to new patterns ($M = 0.47$), old patterns presented once ($M = 0.56$) were identified more often as the one that contained more triangles, $F(1, 53) = 4.06$, $p < .05$. However, identification of the target pattern declined as repetition increased such that participants were no more likely to identify a pattern presented six times ($M = 0.44$) as the one that contained more triangles than one that had not been presented before ($M = 0.47$), $F < 1$. This inverted-U-shaped relationship suggests that participants may have become aware of the pattern's prior exposure status and its biasing influence on their judgment as repetition increased and therefore corrected their responses downward.

Affective judgment. A repeated-measures ANOVA on the preference data showed a significant effect of exposure frequency, $F(3, 159) = 2.73$, $p < .05$. Participants selected old patterns ($M = 0.52$) more often than new patterns ($M = 0.44$), $F(1, 53) = 5.34$, $p < .05$. More central to our hypothesis, participants' preference data showed a significant linear trend in that liking increased monotonically with repetition, $F(1, 53) = 6.22$, $p < .05$. The quadratic trend was not significant, $F < 1$. No correction was observed as exposure frequency increased.

These results provide support that different processes underlie cognitive and affective judgments. One may, however, argue that the dissociation observed may reflect a task order effect in that participants' experience of the affective judgment task has made them more aware of the effect of prior exposures; hence, a correction was observed only for the second task on density judgment but not the first task. This explanation is, however, not likely because the affective task did not alter the exposure frequency of the target stimuli for the cognitive task, since different stimuli were used. Furthermore, if the affective task had indeed made participants more aware of prior exposures, then a uniform correction of all patterns should be observed regardless of how many times they had been presented before. The inverted-U-shaped relationship between exposure and the density judgment observed is not consistent with this explanation.

The present data showing a dissociation between cognitive and affective judgments are also consistent with past findings that participants' affective response increased with exposure frequency, whereas their estimated number of repetition declined when more items were repeated (Van de Bergh & Vrana, 1998). The longer study list may have prompted participants to pay attention to the repetitive nature of the items who then corrected their fluency-based frequency judgment response while their affective response continued to show an increase.[3]

GENERAL DISCUSSION

The results of two studies provide strong support that the mere exposure effect can be better explained by the modified two-factor model (Bornstein, 1989a). The data reported in the present research provide convergent evidence for enhanced affect as the result of uncertainty reduction and not misattribution. In Experiment 1, three different operationalizations of uncertainty reduction were found to enhance liking. First, participants' uncertainty toward the stimuli was reduced through repeated exposures to the stimuli. With repeated exposures, the perceptual fluency arising from prior exposures induced a sense of familiarity toward the stimulus and affective response became more favorable. Second, the subject familiarity of the stimulus also was shown to enhance affect, suggesting that perception of previous encounters enhances, rather than diminishes, affective response toward the stimulus. This held true even when the perception was erroneous in that the stimulus has in fact not been presented before. Finally, participants' confidence in a task associated with the stimulus also resulted in more favorable affective response. The results in Experiment 2 provide further evidence that the mere exposure effect is not driven by misattribution. Participants adjusted their responses relating to a cognitive judgment downward as exposure frequency increased, yet no such correction was observed for their affective responses. These data provide strong evidence that different processes underlie the two types of judgment.

The issue of whether fluency is inherently pleasing, or whether fluency is of neutral valence, is an interesting one. The misattribution model assumes that perceptual fluency is of neutral valence and enhanced affect is the result of individuals' incorrectly attributing the source of perceptual fluency. It is not clear that this assumption is valid. Indeed, Reber and his colleagues (1998) presented evidence that perceptual fluency is positively valenced. Stang (1974) also found that individuals had an intuition about the positive relationship between frequency of exposure and affect. When research participants were asked to imagine that they had seen some Turkish words in varying frequencies, their subsequent affective ratings for these words mirrored typical results of mere exposure studies. These findings are more consistent with the uncertainty reduction explanation that familiarity and perceptual fluency are positively valenced. A positively valenced perceptual fluency is a more parsimonious explanation of the mere exposure effect than one that argues for the misattribution of fluency that is neutrally valenced.

Proponents of the misattribution explanation may argue that the process of misattributing perceptual fluency need not be one that requires the absence of recognition. Rather than attributing fluency to affect only when fluency is not attributed to past exposure, participants may continue to attribute fluency to liking even when they are aware that the stimulus is old and would correct their ratings for attribution only when they become aware of the biasing effect of fluency on their responses (Bargh, 1992). However, this explanation cannot account for the data in Experiment 2, which show that participants did correct for their misattributional bias in the density judgment at six exposures yet continued to misattribute fluency in their affective judgment.

The observation that the magnitude of enhanced affect is greater under conditions of brief exposure duration or subliminal exposure has been interpreted by proponents of the misattribution explanation in terms of participants' adjusting their affective response when the source of fluency became more evident (Bornstein, 1989b). However, tedium also could be invoked to explain this relationship. It has been shown that the mere exposure effect toward a stimulus may be the sum of the repetition effects of each psychophysical feature of the stimulus (Nordhielm, in press). With repeated exposures, affect toward certain features of the stimulus may start to decline as tedium sets in, whereas affect toward other features continues to go up. Hence, liking toward the stimulus as a whole may continue to increase as repetition increases, even though affect toward certain features of the stimulus may have started to decline. The magnitude of the mere exposure effect may therefore be diminished for stimuli exposed for longer durations.

This research provides convergent evidence for a parsimonious account of the mere exposure effect that relies on uncertainty reduction. It also furthers our understanding of the processes of attribution and correction by presenting evidence that participants adjusted their cognitive responses downward as exposure frequency increased, whereas their affective responses continued to climb. This suggests that misattribution of perceptual fluency may be the mechanism underlying cognitive judgments but not affective judgments.

NOTES

1. To avoid confusion, stimuli will be described as either "old" or "new" to indicate objective familiarity and "presented" or "not presented" to indicate subjective familiarity.

2. In this analysis, the stimulus instead of the participant is selected to be the unit of analysis to more appropriately examine the combined effects of objective and subjective familiarity and confidence on affect; otherwise, there would have been many cells without data.

3. It should be noted that these authors argued that a longer list with more items being repeated should reduce the probability that participants become aware of the repeated exposures and thus be less likely to adjust for misattributed affect. Data showing liking decreased for items in a long versus short list were used to support a misattribution account of the exposure effect. However, participants may well be more rather than less aware of the repetition manipulation when more items are repeated, and the less favorable rating for the shorter list with fewer items may instead have been due to tedium. If participants' frequency estimation is based on perceptual fluency, then the dissociation between participants' affective rating and their frequency judgment in the long list condition is consistent with the notion that participants adjusted their frequency estimation but not their affective response.

REFERENCES

Anand, P., & Sternthal, B. (1991). Perceptual fluency and affect without recognition. *Memory and Cognition*, *13*, 293-300.

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). New York: Guilford.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182.

Begg, I., Armour, V., & Kerr, T. (1985). On believing what we remember. *Canadian Journal of Behavioral Science*, *17*, 199-214.

Berkowitz, L., & Troccoli, B. T. (1990). Feelings, direction of attention, and expressed evaluations of others. *Cognition and Emotion*, *4*, 305-325.

Berlyne, D. E. (1966). Curiosity and exploration. *Science*, *153*, 25-33.

Berlyne, D. E. (1970). Novelty, complexity, and hedonic value. *Perception and Psychophysics*, *8*, 279-286.

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

Bornstein, R. F. (1989b). Subliminal techniques as propaganda tools: Review and critique. *Journal of Mind and Behavior*, *10*, 231-262.

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

Bornstein, R. F., & D'Agostino, P. (1994). The attribution and discounting of perceptual fluency: Preliminary tests of a perceptual fluency/attributional model of the mere exposure effect. *Social Cognition*, *12*, 103-128.

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.

Bothwell, R. K., Brigham, J. C., & Deffenbacher, K. A. (1987). Correlation of eyewitness accuracy and confidence: Optimality hypothesis revisited. *Journal of Applied Psychology*, *72*, 691-695.

Cantor, J. R., Bryant, J., & Zillmann, D. (1974). Enhancement of humor appreciation by transferred excitation. *Journal of Personality and Social Psychology*, *30*(6), 812-821.

Crandall, J. E. (1968). Effects of need for approval and intolerance of ambiguity upon stimulus preference. *Journal of Personality*, *36*, 67-83.

Duchek, J. M., & Neely, J. H. (1989). A dissociative Word-Frequency × Levels-of-Processing interaction in episodic recognition and lexical decision tasks. *Memory and Cognition*, *17*, 148-162.

Fischhoff, B., Slovic, P., & Lichtenstein, S. (1977). Knowing with certainty: The appropriateness of extreme confidence. *Journal of Experimental Psychology: Human Perception and Performance*, *5*, 552-564.

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, *102*, 4-27.

Harrison, A. A. (1977). Mere exposure. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 39-82). New York: 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: Leaning, 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., & Dywan, J. (1989). Memory attributions. In H. L. Roediger & F.I.M. Craik (Eds.), *Varieties of memory and consciousness: Essays in honour of Endel Tulving* (pp. 391-422). Hillsdale, NJ: Lawrence Erlbaum.

Jacoby, L. L., Woloshyn, V., & Kelley, C. M. (1989). Becoming famous without being recognized: Unconscious influences of memory produced by dividing attention. *Journal of Experimental Psychology: General*, *118*, 115-125.

Koriat, A., Lichtenstein, S., & Fischhoff, B. (1980). Reasons for confidence. *Journal of Experimental Psychology: Human Learning and Memory*, *6*(2), 107-118.

Krugman, H. E., & Hartley, E. L. (1960). The learning of tastes. *Public Opinion Quarterly*, *24*, 621-631.

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

Lee, A. Y. (1994). The mere exposure effect: Is it a mere case of misattribution? In C. T. Allen & D. R. John (Eds.), *Advances in consumer research* (Vol. 21, pp. 270-275). Provo, UT: Association for Consumer Research.

Lombardi, W. J., Higgins, E. T., & Bargh, J. A. (1987). The role of consciousness in priming effects of categorization: Assimilation versus contrast as a function of awareness of the priming task. *Personality and Social Psychology Bulletin*, *13*, 411-429.

Losch, M. E., & Cacioppo, J. T. (1990). Cognitive dissonance may enhance sympathetic tonus, but attitudes are changed to reduce negative affect rather than arousal. *Journal of Experimental Social Psychology*, *26*, 289-304.

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.

Moreland, R. L., & Zajonc, R. B. (1976). A strong test of exposure effects. *Journal of Experimental Social Psychology*, *12*, 170-179.

Nordhielm, C. (in press). The influence of type of processing on advertising repetition effects. In L. Scott and R. Batra (Eds.), *Persuasive Imagery: A Consumer Response Perspective*. Mahwah, NJ: Lawrence Erlbaum.

Obermiller, C. (1985). Varieties of mere exposure: The effects of processing style and repetition on affective response. *Journal of Consumer Research*, *12*, 17-30.

Petty, R. E., & Wegener, D. T. (1993). Flexible correction processes in social judgment: Correcting for context-induced contrast. *Journal of Experimental Social Psychology*, *29*, 137-165.

Reber, R., Winkielman, P., & Schwarz, N. (1998). Effects of perceptual fluency on affective judgments. *Psychological Science*, *29*(1), 45-48.

Reisenzein, R., & Gattinger, E. (1982). Salience of arousal as a mediator of misattribution of transferred excitation. *Motivation and Emotion*, *6*, 315-328.

Roediger, H. L. III, & McDermott, K. B. (1993). Implicit memory in normal human subjects. In F. Boller & J. Grafman (Eds.), *Handbook of neuropsychology* (Vol. 8, pp. 63-131). New York: Elsevier North-Holland.

Roediger, H. L. III, Weldon, M. S., Stadler, M. A., & Riegler, G. H. (1992). Direct comparison of word stems and word fragments in implicit and explicit retention tests. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *18*, 1251-1269.

Schacter, D. L. (1987). Implicit memory: History and current status. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *13*, 501-518.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology*, *45*, 513-523.

Seamon, J. G., Brody, N., & Kauff, D. M. (1983). 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., 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.

Seamon, J. G., Williams, P. C., Crowley, M. J., Kim, I. J., Langer, S. A., Orne, P. J., & Wishengrad, D. L. (1995). The mere exposure effect is based on implicit memory: Effects of stimulus type, encoding conditions, and number of exposures on recognition and affect judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *21*, 711-721.

Srinivas, K. (1993). Perceptual specificity in nonverbal priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*, 582-602.

Srinivas, K., & Roediger, H. L. III. (1990). Classifying implicit memory tests: Category association and anagram solution. *Journal of Memory and Language*, *29*, 389-412.

Stang, D. J. (1974). Intuition as artifact in mere exposure studies. *Journal of Personality and Social Psychology*, *30*, 647-653.

Strack, F., Schwarz, N., Bless, H., Kuebler, A., & Waenke, M. (1993). Awareness of the influence as a determinant of assimilation versus contrast. *European Journal of Social Psychology*, *23*, 53-62.

Tesser, A., Pilkington, C. J., & McIntosh, W. D. (1989). Self-evaluation maintenance and the mediational role of emotion: The perception of friends and strangers. *Journal of Personality and Social Psychology*, *57*, 442-456.

Van de Bergh, O., & Vrana, X. R. (1998). Repetition and boredom in a perceptual fluency/attributional model of affective judgments. *Cognition and Emotion*, *14*, 533-553.

Whittlesea, B.W.A., Jacoby, L. L., & Girard, K. A. (1990). Illusions of immediate memory: Evidence of an attributional basis for feelings of familiarity and perceptual quality. *Journal of Memory and Language*, *29*, 716-732.

Wilson, W. R. (1979). Feeling more than we can know: Exposure effects without learning. *Journal of Personality and Social Psychology*, *37*, 811-821.

Witherspoon, D., & Allan, L. G. (1985). The effects of a prior presentation on temporal judgments in a perceptual identification task. *Memory and Cognition*, *13*, 101-111.

Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology Monographs*, *9*(2, Pt. 2), 1-27.

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist*, *35*, 151-175.

Zanna, M. P., & Cooper, J. (1974). Dissonance and the pill: An attribution approach to studying the arousal properties of dissonance. *Journal of Personality and Social Psychology*, *29*, 703-709.

Received November 4, 1999

Revision accepted October 23, 2000