

# Research Report

## EFFECTS OF PERCEPTUAL FLUENCY ON AFFECTIVE JUDGMENTS

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**Abstract**—According to a two-step account of the mere-exposure effect, repeated exposure leads to the subjective feeling of perceptual fluency, which in turn influences liking. If so, perceptual fluency manipulated by means other than repetition should influence liking. In three experiments, effects of perceptual fluency on affective judgments were examined. In Experiment 1, higher perceptual fluency was achieved by presenting a matching rather than nonmatching prime before showing a target picture. Participants judged targets as prettier if preceded by a matching rather than nonmatching prime. In Experiment 2, perceptual fluency was manipulated by figure-ground contrast. Stimuli were judged as more pretty, and less ugly, the higher the contrast. In Experiment 3, perceptual fluency was manipulated by presentation duration. Stimuli shown for a longer duration were liked more, and disliked less. We conclude (a) that perceptual fluency increases liking and (b) that the experience of fluency is affectively positive, and hence attributed to positive but not to negative features, as reflected in a differential impact on positive and negative judgments.

Does processing fluency enhance preference for neutral stimuli? This possibility has been proposed as an explanation of the mere-exposure effect (Bornstein, 1989; Kunst-Wilson & Zajonc, 1980; Seamon, Marsh, & Brody, 1984; Zajonc, 1968). According to the two-step attributional theory, the repeated presentation of a stimulus enhances the subjective feeling of processing fluency when the stimulus is encountered again. This enhanced perceptual fluency is then misattributed to liking, resulting in a preference for old over new stimuli (Bornstein & D'Agostino, 1994; Jacoby, Kelley, & Dywan, 1989). However, repetition may affect preference by mechanisms other than perceptual fluency. For example, Zajonc (1971, 1997) proposed that repeated exposure may enhance preference via habituation of the orienting response.

Thus, to test if processing fluency enhances liking, it is useful to turn to manipulations other than mere exposure. Whittlesea (1993, Experiment 5) manipulated conceptual fluency by presenting words in a neutral or predictive semantic context ("The evening gown was missing a . . . bead" vs. "The bored student opened her mouth to . . . yawn"). The words that appeared in the predictive context were pronounced faster, indicating enhanced processing fluency, and were judged as more pleasant. Although suggestive, Whittlesea's findings leave unclear whether the predicted words were rated as more pleasant because of high processing fluency or because they were consistent with the semantic context whereas the unpredicted words were somewhat incongruous with the semantic context. Moreover, Whittlesea's findings leave open if perceptual, as opposed to conceptual, manipulations of fluency can enhance preference.

The current experiments tested the relation between perceptual fluency and preference with three different manipulations. In Experiment 1, the

processing of a target picture was either facilitated or disrupted by a briefly presented visual prime. We predicted that target pictures preceded by a facilitating prime would be judged more positively. The logic of this experiment is similar to that of Whittlesea's (1993) in that fluency was manipulated by the preceding context. In Experiment 2, perceptual fluency was manipulated by changes in the figure-ground contrast. Pictures with higher figure-ground contrast are clearer, and we hypothesized that they would be judged more positively. The logic of this manipulation was based on Checkosky and Whitlock's (1973) finding that low clarity of patterns increases reaction times in a recognition task, indicating slower encoding for low-clarity stimuli. In Experiment 3, fluency was manipulated by presentation time of the target stimulus. Our hypothesis was that people would like the pictures more the longer they were presented. The logic of this manipulation was based on Mackworth's (1963) finding that enhancing the presentation time of stimuli enhances the accuracy of perceptual identification.

Note that visual clarity and presentation duration were used in previous research as dependent variables. Specifically, repeated exposure to a stimulus, presumably resulting in higher perceptual fluency, was found to elicit judgments of higher visual clarity (Whittlesea, Jacoby, & Girard, 1990, Experiment 4) and of longer duration of stimulus presentations (Witherspoon & Allan, 1985). Our experiments tested a reversal of this influence: If repeated exposure increases experienced fluency, which in turn results in judgments of higher clarity and longer duration, direct manipulations of the latter variables may also result in experiences of greater perceptual fluency. Increased fluency, in turn, may influence affective judgments, thus paralleling the well-known effects of mere exposure, without changes in exposure frequency.

The current experiments addressed two additional issues. In addition to assessing preferences, Experiment 1 measured perceptual fluency directly by collecting recognition latencies. This allowed us to examine if gains in liking parallel gains in recognition speed. Second, Experiments 2 and 3 examined if perceptual fluency itself is affectively neutral or affectively positive. If perceptual fluency is neutral, it may be misattributed to positive features if participants are asked a question framed in a positive way (e.g., "prettiness," "liking"), and to negative features if the question is framed in a negative way (e.g., "ugliness," "disliking"; see Bornstein & D'Agostino, 1994, p. 125). If perceptual fluency is affectively positive, however, it should always lead to more positive judgments, independent of the question's focus. Some findings indicate that perceptual fluency may be attributed to whatever feature participants focus on, resulting in evaluations of the stimulus as, for example, brighter, darker, and clearer (e.g., Mandler, Nakamura, & Van Zandt, 1987; Whittlesea, 1993). So far, however, effects of perceptual fluency on affective judgments have been obtained only for positively valenced judgments. In the study by Mandler et al. (1987), participants liked repeatedly shown polygons more than a new polygon, but when participants were asked which polygon they disliked more, their judgments were not significantly different from chance level. To address these issues, Experiments 2 and 3 explored the impact of contrast and presentation time, respectively, on judgments of prettiness (or liking) and ugliness (or disliking) of visual

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stimuli. All three experiments were run individually on Macintosh computers with color screens, using PsyScope, Version 1.0.2b.4 (Cohen, MacWhinney, Flatt, & Provost, 1993).

## EXPERIMENT 1

### Method

Fifty-three undergraduates at the University of Michigan judged 20 distinct drawings of neutral objects (e.g., horse, plane) taken from Snodgrass and Vanderwart (1980). Each drawing was presented for 2 s. The recognition of the object in the drawing was made difficult by 30% degradation of the picture foreground and 40% degradation of the picture background. Immediately before each target picture, another drawing was presented for 25 ms. This drawing represented either a contour of the target picture (matching prime) or a contour of a different picture (mismatching prime). The contour drawings were degraded 90%, and the background was degraded 40%. The short presentation time and the degradation ensured the unobtrusiveness of the priming procedure. In postexperimental interviews, participants expressed surprise that priming pictures had been presented.

Each participant rated the same series of 20 pictures twice, for a total of 40 judgments. About half of the participants first made 20 preference judgments ("how pretty is the picture?") on a scale from 1 (*not at all pretty*) to 9 (*very pretty*) and then made 20 recognition judgments ("press space bar as soon as you can identify the object in the picture"). For the other participants, the order of judgments was reversed. Each picture was preceded by a fixation point presented for 500 ms. The interval between the fixation point and the onset of the prime was 500 ms. To avoid any stimulus-specific effects, the targets paired with matching primes for some participants were paired with mismatching primes for other participants.

### Results and Discussion

Because there were no effects for the order in which the preference and recognition judgments were made, the judgments from both orders were combined for subsequent analyses. The analyses revealed that the drawings preceded by matching primes were judged as prettier ( $M = 4.66$ ,  $SD = 1.10$ ) than the drawings preceded by mismatching primes ( $M = 4.39$ ,  $SD = 1.14$ ),  $t(52) = 2.43$ ,  $p < .05$ . Moreover, the drawings preceded by matching primes were recognized faster ( $M = 1,470$  ms,  $SD = 1,330$ ) than the drawings preceded by mismatching primes ( $M = 2,415$  ms,  $SD = 2,412$ ),  $t(52) = 4.44$ ,  $p < .001$ .

Overall, the results suggest that the visual-priming manipulation enhanced both perceptual fluency (as measured by recognition speed) and preference (as measured by prettiness judgments).

## EXPERIMENT 2

Experiment 2 examined whether affective judgments would be influenced by enhanced perceptual fluency resulting from a manipulation of figure-ground contrast. Participants rated the prettiness of circles with different contrast to the background. We expected high-contrast stimuli to be rated prettier than low-contrast ones. One group of participants was exposed to dark circles on a white background (dark-on-white group), and a second group was exposed to light circles on a black background (light-on-black group). This design ensured that

differences in preference would be due to differences in contrast, not to differences in preference for specific graytones of circles.

In addition, this experiment tested whether perceptual fluency is affectively neutral or positive. An additional group of participants was asked to rate the ugliness of circles so that we could test for an interaction between the question's focus (prettiness vs. ugliness) and contrast. If, as expected, higher figure-ground contrast was associated with higher ratings for the prettiness groups and lower ratings for the ugliness group, this finding would indicate perceptual fluency is affectively positive. However, if ratings increased with contrast for all groups, we would conclude that perceptual fluency is affectively neutral.

### Method

Thirty-six undergraduates were randomly assigned to three between-subjects conditions. Participants judged either the prettiness of dark circles on a white background, the prettiness of light circles on a black background, or the ugliness of dark circles on a white background.

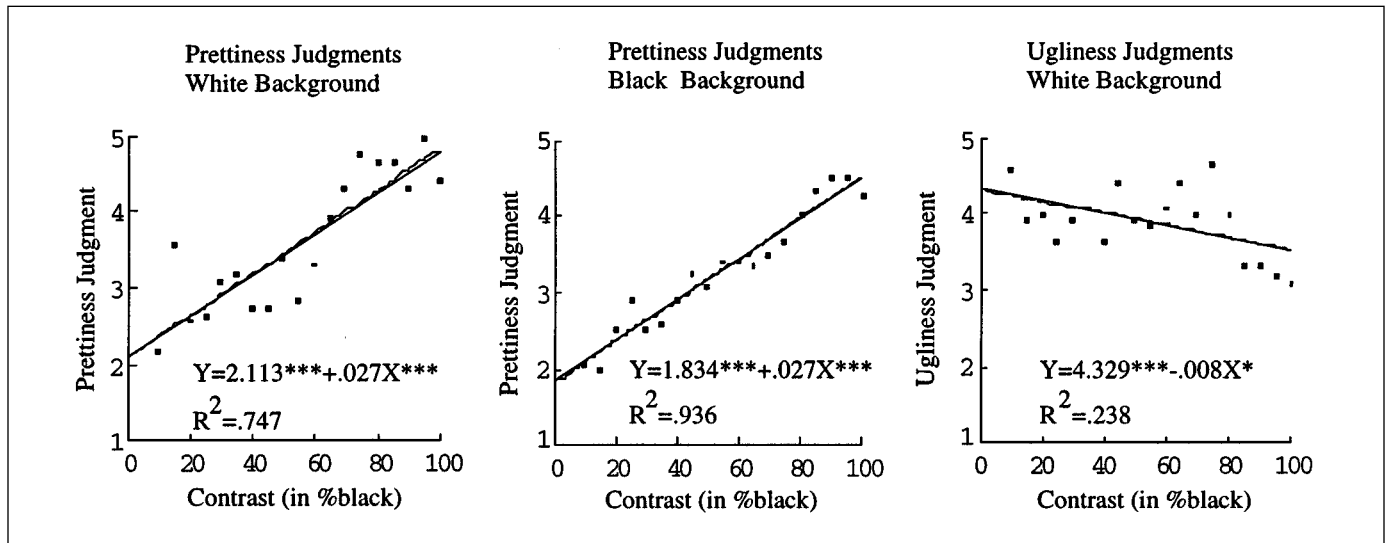
Nineteen circles (diameter: 5 cm) were presented for 1 s each in the center of the screen. For the dark-on-white and ugliness groups, the circles were filled with graytones ranging from 10% to 100% black, in intervals of 5% (CMYK-scale in MacDrawPro 1.0v1<sup>1</sup>). For the light-on-black group, the background was black, and the graytones of the circles ranged from 90% to 0% black, in intervals of 5%. Each circle was preceded by a fixation point presented for 500 ms. The interval between the fixation point and the onset of the stimulus was 200 ms. After presentation of the circle, the participant was asked, "How pretty (ugly) is the circle?" The rating scale ranged from 0, *not at all pretty (ugly)*, to 9, *very pretty (ugly)*. The order of presentation of the 19 circles was randomized for each participant.

### Results and Discussion

We calculated linear regressions with the mean rating of each group as the dependent variable and contrast as the independent variable. Figure 1 shows that participants who rated the prettiness of dark circles against a white background liked the darker (high-contrast) circles more ( $p < .001$ ). Participants who rated the prettiness of light circles on a black background liked the lighter (high-contrast) circles more ( $p < .001$ ). This finding shows that the effects are due to a preference for contrast rather than darker graytones per se. As expected, the ugliness ratings decreased with contrast ( $p < .05$ ). Finally, we analyzed whether the linear trends of the judgments were different for the positive-focus (prettiness) and the negative-focus (ugliness) groups, respectively. The planned contrast of the interaction between group (the two positive groups combined vs. the negative group) and linear trend was significant,  $F(1, 34) = 16.15$ ,  $p < .001$ .

The results suggest that people like high-contrast objects more than low-contrast ones. Moreover, perceptual fluency is affectively positive, not nonspecific, and leads to higher prettiness and lower ugliness judgments.

1. To obtain accurate graytones with high resolutions, we saved the circles as PICT II files using MacDrawPro 1.0v1; then, these files were saved as PICT files using Adobe Photoshop 2.5.1; the latter files were used by the PsyScope program.



**Fig. 1.** Prettiness and ugliness judgments as a function of figure-ground contrast. The left panel shows prettiness ratings for gray and black circles on a white background. The center panel shows prettiness ratings for gray and white circles on a black background. The right panel shows ugliness ratings for gray and black circles on a white background. Higher ratings indicate greater prettiness and ugliness, respectively. Regression results are reported.

### EXPERIMENT 3

Experiment 3 was designed to replicate and clarify the findings of Experiment 2. Perhaps people like high-contrast stimuli not because of perceptual fluency, but because of some stimulus-based features inherent to figure-ground contrast. To address this possibility, we manipulated perceptual fluency by varying the presentation time of stimuli, keeping stimulus features constant across conditions. Higher presentation times enable the extraction of more information from stimuli (Mackworth, 1963), thus increasing experienced fluency. Accordingly, stimuli presented for longer durations should be liked more.

We also wanted to replicate the finding that perceptual fluency is affectively positive, rather than neutral, using a different manipulation of question focus. Participants in the positive-focus condition were asked for judgments of “liking,” whereas participants in the negative-focus condition were asked for judgments of “disliking.” We expected that the responses would parallel the findings for prettiness and ugliness judgments in Experiment 2 (i.e., that stimuli presented for longer durations would be liked more and disliked less).

### Method

Twenty undergraduates from the Université de Bourgogne at Dijon, France, were randomly assigned to the positive-focus (liking) and the negative-focus (disliking) conditions. The stimuli were 20 square patterns (4 × 4 cm), 8 squares wide and 8 squares high. In each pattern, 32 randomly selected squares were black, and the other 32 were white. Five patterns each were shown at the center of the screen for 100, 200, 300, and 400 ms, respectively, immediately followed by a random mask shown for 250 ms. Each pattern was preceded by a fixation point presented for 500 ms in the center of the screen. The interval between the fixation point and the onset of the stimulus was 200 ms. The positive-focus group was asked, “Do you like the

pattern?” (“Est-ce que ce dessin vous plaît?”), whereas the negative-focus group was asked, “Do you dislike the pattern?” (“Est-ce que ce dessin vous déplaît?”). The scale ranged from 0, *not at all* (“pas du tout”), to 9, *much* (“beaucoup”), for both groups. The order of presentation of the patterns was fixed. For each participant, the computer program assigned randomly one of the four presentation times to each pattern.

### Results and Discussion

Means and standard deviations are shown in Table 1. We predicted that liking judgments would increase, but disliking judgments would decrease, with increasing exposure times. The results confirmed this prediction,  $F(1, 18) = 5.35, p < .05$ , for the interaction of exposure time and group. The simple effect of exposure time was marginally significant,  $F(1, 9) = 2.91$  and  $2.53, p < .06$  and  $.07$ , one-tailed, for the liking and disliking groups, respectively.

The results suggest that people like objects that are presented for longer times more than objects that are presented for shorter times, presumably because longer exposure increases perceptual fluency. Note

**Table 1.** Mean liking and disliking judgments in Experiment 3

| Group     | Presentation time |             |             |             |
|-----------|-------------------|-------------|-------------|-------------|
|           | 100 ms            | 200 ms      | 300 ms      | 400 ms      |
| Liking    | 3.02 (2.45)       | 3.12 (2.65) | 3.36 (2.64) | 3.94 (3.03) |
| Disliking | 4.18 (2.34)       | 3.68 (2.07) | 3.30 (2.11) | 3.64 (2.36) |

*Note.* Standard deviations are in parentheses.

also that the same stimuli were presented under all duration conditions. Finally, perceptual fluency again increased judgments of liking and decreased judgments of disliking.

## GENERAL DISCUSSION

The research presented here suggests that preference for neutral stimuli can be enhanced by manipulations of fluency in the perceptual domain, independently of stimulus repetition. The experiments relied on three different ways to facilitate the visual discrimination or recognition of the stimulus (visual priming, figure-ground contrast, and exposure duration). Clearly, our manipulations are different from the repeated-exposure manipulation, which relies on activation of information stored in memory. However, all the discussed manipulations are similar in that they facilitate processing of the stimulus. We assume that this facilitation leads to a subjective experience of processing fluency, which is then attributed to the quality of the stimulus, as proposed by the two-step account of mere-exposure effects (Bornstein & D'Agostino, 1994; Jacoby et al., 1989).

The current findings show that perceptual fluency is affectively positive, rather than neutral, as reflected in increased judgments of prettiness and liking and decreased judgments of ugliness and disliking of stimuli. Thus, the present findings are incompatible with the notion of nonspecific activation. Specifically, research into nonaffective judgments indicated that perceptual fluency may increase the extremity of opposite judgments, leading, for example, to reports of increased darkness as well as increased brightness, depending on the focus of the question asked (e.g., Mandler et al., 1987). In contrast, the affective judgments assessed in the present experiments reflected increased liking under conditions of increased fluency, independent of the focus of the question.

Finally, a limitation needs to be acknowledged. The presentation times used in the present studies, as in research into mere-exposure effects, were rather short. Thus, it remains an open issue if manipulations of perceptual fluency would have similar influences on the evaluation of stimuli under unconstrained or very long exposure times. Despite this limitation, the present findings demonstrate that perceptual fluency manipulated by means other than repetition enhances preference for different kinds of visual stimuli.

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