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Happiness Cools the Warm Glow of Familiarity: Psychophysiological Evidence That Mood Modulates the Familiarity-Affect Link

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Abstract

People often prefer familiar stimuli, presumably because familiarity signals safety. This preference can occur with merely repeated old stimuli, but it is most robust with new but highly familiar prototypes of a known category (beauty-in-averageness effect). However, is familiarity always warm? Tuning accounts of mood hold that positive mood signals a safe environment, whereas negative mood signals an unsafe environment. Thus, the value of familiarity should depend on mood. We show that compared with a sad mood, a happy mood eliminates the preference for familiar stimuli, as shown in measures of self-reported liking and physiological measures of affect (electromyographic indicator of spontaneous smiling). The basic effect of exposure on preference and its modulation by mood were most robust for prototypes (category averages). All this occurs even though prototypes might be more familiar in a happy mood. We conclude that mood changes the hedonic implications of familiarity cues.

Keywords

emotions, memory, electrophysiology, preferences, judgment

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Liking for previously encountered stimuli, or the "warm glow of familiarity," is a classic phenomenon (Titchener, 1915). One source of "warm glow" is a simple repetition (Zajonc, 1968, 2001). Such "mere exposure" enhances familiarity and liking (Whittlesea & Price, 2001).[1] This enhancement sometimes generalizes to new but categorically similar exemplars, producing so-called structural mere-exposure effects (Gordon & Holyoak, 1983). However, the most robust exposure effects on familiarity and liking occur on prototypes of the presented category (after all, prototypes resemble all the exposed exemplars). Thus, prototypes are rated as highly familiar, even when they are objectively new—a memory illusion observed with stimuli ranging from random dots to words (e.g., Deese, 1959; Posner & Keele, 1968; Whittlesea, 2002). Prototypes are also highly liked, an effect known as *beauty-in-averageness* (Langlois & Roggman, 1990). It occurs with a range of stimuli—including abstract patterns, faces, watches, and cars—and dependent measures—including attractiveness ratings and psychophysiological responses (Halberstadt, 2006). For example, prototypes of a dot pattern from an exposed versus novel category elicit more incipient "smiles" (subtle increase in the activity of face muscles associated with smiling; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006).

Familiarity and Liking

But is familiarity always warm? Several accounts assume so. Titchener (1915) said that "intrinsically, recognition is always an agreeable and relaxing experience" (p. 179). Some models of the mere-exposure effect posit that familiarity inevitably increases positivity because unreinforced repetition is a form of conditioning to the absence of negative consequences—associating the stimulus with relief from fear of novelty (e.g., Zajonc, 2001). Some models of the fluency-affect link assume that familiarity is intrinsically rewarding because it is connected with easy, efficient and conflict-free processing (e.g.,

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Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Finally, evolutionary models suggest that koinophilia (preference for familiar features) occurs because typicality is a cue to high mate value (Thornhill & Gangestad, 1993).

In contrast, other accounts see the familiarity-positivity link as context dependent. After all, familiarity is only a heuristic cue to safety. Thus, as with any heuristic cue, its validity and hedonic meaning vary by context (Hertwig, Herzog, Schooler, & Reimer, 2008). Specifically, the familiarity-positivity link should depend on whether individuals are tuned toward safety concerns. Familiarity should be valued in an unsafe environment, but less so in a benign environment (e.g., Bornstein, 1989). Analogously, in a strange city a familiar face elicits a warm glow, whereas locally the same face prompts a yawn. Numerous studies (and parents) have observed that in unsafe environments infants are neophobic, but in safe settings, they are less so (Shore, 1994). Similarly, in multiple species, stress increases neophobia, whereas comfort reduces it (Zuckerman, 2005).

Much psychological research points out that one signal of environmental safety or danger is an individual's mood (e.g., Clore, Schwarz, & Conway, 1994; Schwarz, 2002). Bad mood signals a problem, tuning individuals toward safety concerns, whereas good mood signals that an environment is benign. Tuning accounts assume that mood adjusts cognitive and affective reactions so that they best serve the individual in the specific context. Thus, mood should modulate affective responses to familiarity, with greater preference for familiarity in negative than positive mood.

The Current Research

We explored how mood modulates affective and cognitive responses to familiarity, expecting greater value of familiarity in a sad mood. One interesting prediction concerns the mood modulation of prototypicality preference, as happiness should eliminate the otherwise robust beauty-in-averageness effect. Importantly, happiness should not reduce familiarity per se. In fact, earlier studies reported that happiness increases familiarity of new but categorically primed verbal prototypes, enhancing false-memory effects, presumably because happiness promotes relation-based rather than item-specific processing (Storbeck & Clore, 2005).

Psychophysiological measurement

Testing our predictions required going beyond self-reports. Self-reports can reflect not only genuine "hot" reactions to stimuli, but also "cold" judgments. For example, preference judgments could be based on pattern "goodness" or one's own history with the stimulus. Self-reports are also ill suited for capturing early, spontaneous reactions and may reflect later, deliberative processes. Therefore, in our main study, we also used psychophysiology.

To capture subtle changes in valence, we used facial electromyography (EMG; e.g., Cacioppo, Petty, Losch, & Kim, 1986). EMG can detect affective responses to manipulations of familiarity. Thus, greater EMG activity over the cheek "smiling" region, but not over the brow "frowning" region, is elicited by repeated stimuli (Harmon-Jones & Allen, 2001), perceptually primed stimuli (Winkielman & Cacioppo, 2001), and category prototypes (Winkielman et al., 2006).

We also measured skin conductance response (SCR), which reflect sympathetic arousal. The psychological meaning of SCR varies with context. When familiar stimuli are distinct and task relevant, they trigger SCRs (Morris, Cleary & Still, 2008; Tranel & Damasio, 1985). However, sometimes novel, surprising, or fearful stimuli can too (Dawson, Schell, & Filion, 2000). An important point is that SCR provides separate information about arousal responses that is separate from valence.

Paradigm

Our paradigm came from earlier research on prototypicality preferences (Winkielman et al., 2006). It uses abstract, random-dot patterns (Posner & Keele, 1968). Thus, it minimizes problems inherent to meaningful stimuli, such as greater symmetry or prior experience with real-world prototypes (Rhodes, Sumich, & Byatt, 1999). In the first, exposure phase, participants viewed 14 converging distortions (i.e., "seen members") of a category prototype. The 15th distortion (i.e., "unseen member") and the prototype were not shown. In the subsequent test phase, participants viewed six patterns: category prototype, seen member, unseen member, and three matched control stimuli from an unexposed category. There were 20 categories in total. Ten randomly chosen categories were exposed; the other 10 categories served as controls. Participants rated each pattern on a continuous memory or liking scale. In the *liking* condition, participants were asked, "How much do you like this pattern?" and indicated their responses on a scale ranging from 1, *not at all*, to 9, *very much*. In the *memory* condition, participants were asked, "How old was the stimulus?" They were then given a memory confidence scale, which ranged from 1, *definitely new* (i.e., greatest confidence that the stimulus was new), to 8, *definitely old* (i.e., greatest confidence that the stimulus was old). For more information, see Figure 1 and Supporting Details in the Supplemental Material available on-line.

All data are presented here as a difference between the familiar versus unfamiliar (control) version of the pattern. This allowed us to assess three related exposure effects. First, we compared prototypes of exposed (by presentation of converging distortions) categories with control patterns from unexposed categories. This allowed us to assess the beauty-in-averageness effect and the prototype-memory illusion. Second, we compared seen members of exposed categories with members of the control category. This allowed us to assess the standard mere-exposure effect. Third, we compared unseen members of the exposed category with members of the control category. This allowed us to assess the structural mere-exposure effect (enhancement for categorically related items).

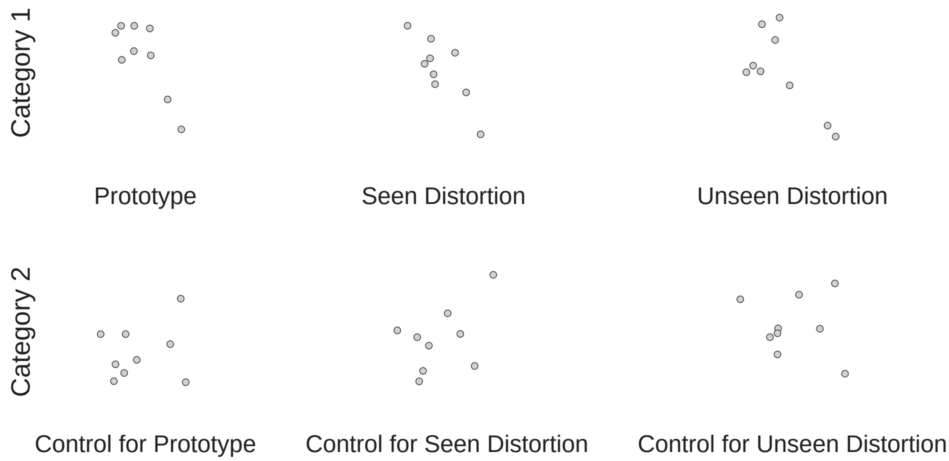

Fig. 1. Examples of the stimuli (i.e., random-dot patterns) that were used in all experiments. In the exposure phase, participants viewed 14 converging distortions (i.e., seen members) of each of 10 category prototypes; a 15th distortion (i.e., unseen member) and the prototype were not shown. In the subsequent test phase, for each exposed category participants viewed six patterns: category prototype, seen member, and unseen member from the exposed category (e.g., Category 1) and three matched control stimuli from an unexposed category (e.g., Category 2).

Experiments 1 and 2: Pretests

We conducted two behavioral pretests, described in the Supporting Details in the Supplemental Material available on-line. Figure 2 presents the results. Experiment 1 established that under nonmanipulated-mood conditions, our procedure robustly enhanced self-reported familiarity and self-reported liking of prototypes from exposed categories. Experiment 2 tested the mood effects on self-reports of familiarity. It showed that our procedure enhanced familiarity of new prototypes from exposed categories in both the happy and the sad mood conditions. One interesting finding was that random-dot prototypes were rated as particularly familiar in the positive compared with the negative mood condition. This finding extends reports that happiness increases false memory for verbal prototypes (Storbeck & Clore, 2005). These pretest results set the stage for the main experiment, which explored how mood changes affective implications of familiarity.

Experiment 3: Psychophysiological Examination

Experiment 3, the main experiment, examined mood effects on reactions toward familiar stimuli, using self-reports and EMG as measures of affect and SCR as an indicator of familiarity. We predicted that compared with a positive mood, a negative mood would result in a stronger preference for familiar stimuli, especially the prototype.

Method

Sixteen undergraduates at the University of California, San Diego, participated for extra credit. We first determined their resting, premanipulation (10-s period) physiological baselines. Next, we manipulated mood by instructing participants to focus on and describe a happy (or sad) autobiographical memory. Participants rated their mood state on a 7-point scale. To maintain their mood, participants subsequently listened to music (cf. Experiment 2). Again, we measured resting activity (10-s period), which served as a physiological mood-manipulation check. Next, participants performed the dot-pattern task. See Supporting Details in the Supplemental Material available on-line for information about data recording and data reduction.

Results and discussion

Mood-manipulation check. On ratings, an analysis of variance (ANOVA) for mood and gender revealed only a main effect, with participants reporting feeling better in the happy (M = 5.50) condition than in the sad (M = 3.75) condition, $F(1, 15) = 7.08$, $p < .01$. Mood also influenced physiology. Specifically, for the EMG data, an ANOVA for mood, muscle (zygomaticus vs. corrugator), time (10-s rest interval after mood induction), and gender revealed a Muscle × Mood × Time interaction, $F(9, 108) = 2.29$, $p < .03$, $\eta_p^2 = .16$. This interaction was driven by a significant Mood × Time interaction for the corrugator muscle, $F(9, 108) = 3.76$, $p < .01$. In the later 5 s, sad participants showed greater corrugator than zygomaticus activity, $t(7) = 3.63$, $p < .01$. Analyses of SCR, a nonspecific measure of arousal, revealed an expected overall increase in response level after mood manipulation ($p < .01$), but no valence effects. In short, the mood manipulation was successful, as indicated by both self-report and physiological measures. Because there were no gender effects, this variable was dropped from further analyses.

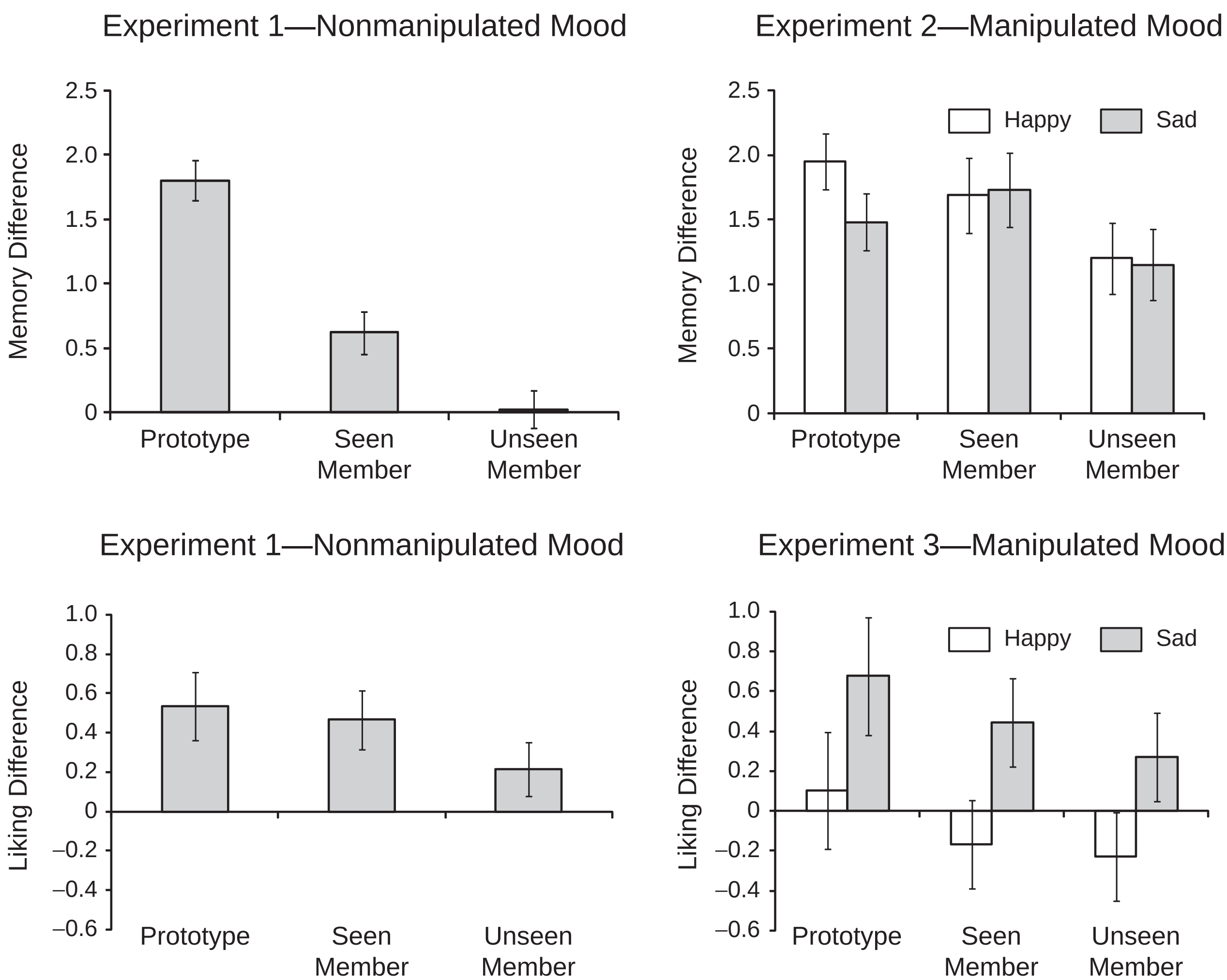

Fig. 2. Results for familiarity and liking. The graphs on the left present mean familiarity and liking difference scores (exposed category – control category) in Experiment 1 as a function of stimulus type. The graphs on the right present mean familiarity difference scores in Experiment 2 and mean liking difference scores in Experiment 3 as a function of stimulus type and mood. Scores for the liking scale ranged from 1, *not at all*, to 9, *very much*; scores for the memory scale ranged from 1, *definitely new*, to 8, *definitely old*. Error bars represent standard errors.

Self-reports of liking. Figure 2 shows how familiarity influenced liking of stimuli in different moods. An ANOVA with mood and stimulus type (prototype vs. seen vs. unseen) revealed a main effect of mood, $F(1, 14) = 8.15$, $p < .02$, $\eta_p^2 = .37$, with familiar stimuli liked more in a sad mood. Next, we focused on specific items. Sad participants robustly liked the old prototype more than the new prototype, $t(7) = 3.11$, $p < .02$. Critically, happiness eliminated this beauty-in-averageness effect ($t < 1$). Sad participants showed only weak effects on seen items and unseen items ($ts = 1.7$, $ps < .14$). This was reflected in a linear trend: prototype, seen, unseen, $F(1, 7) = 4.42$, $p = .07$. There were no effects on seen and unseen items for happy participants ($ts < 1$).

EMG. Figure 3 shows old-new difference scores in zygomaticus (smiling) response as a function of mood, pattern type, and time.[2] A Mood × Stimulus Type × Time (1–5 s after stimulus onset) ANOVA revealed a significant three-way interaction for zygomaticus activity, $F(8, 112) = 2.10$, $p < .05$, $\eta_p^2 = .13$. The old-new difference scores for prototypes were significantly larger in the sad than in the happy mood condition as early as 2 s after stimulus onset, peaking at 4 s and then disappearing by 5 s ($ps \leq .05$). There were no effects for seen and unseen items. As in earlier studies, no familiarity effects were obtained for frowning EMG (we return to this issue in the General Discussion).

SCR. A Mood × Stimulus Type × Time (1–5 s) ANOVA revealed a main effect of mood, $F(1, 14) = 22.01$, $p < .001$. Figure 4 shows greater responses in the happy than sad mood condition; although this main effect is partly due to a decrease in SCR to familiar stimuli in the sad mood. The mood main effect was qualified by a Mood × Time interaction, $F(4, 112) = 3.62$, $p < .05$, reflecting that mood differences on SCR became more pronounced after 2 s. There was no Mood × Stimulus Type interaction. However, time interacted with stimulus type, so that after 2 s, prototypes elicited stronger responses than other patterns, $F(8, 112) = 2.02$, $p = .05$.[3]

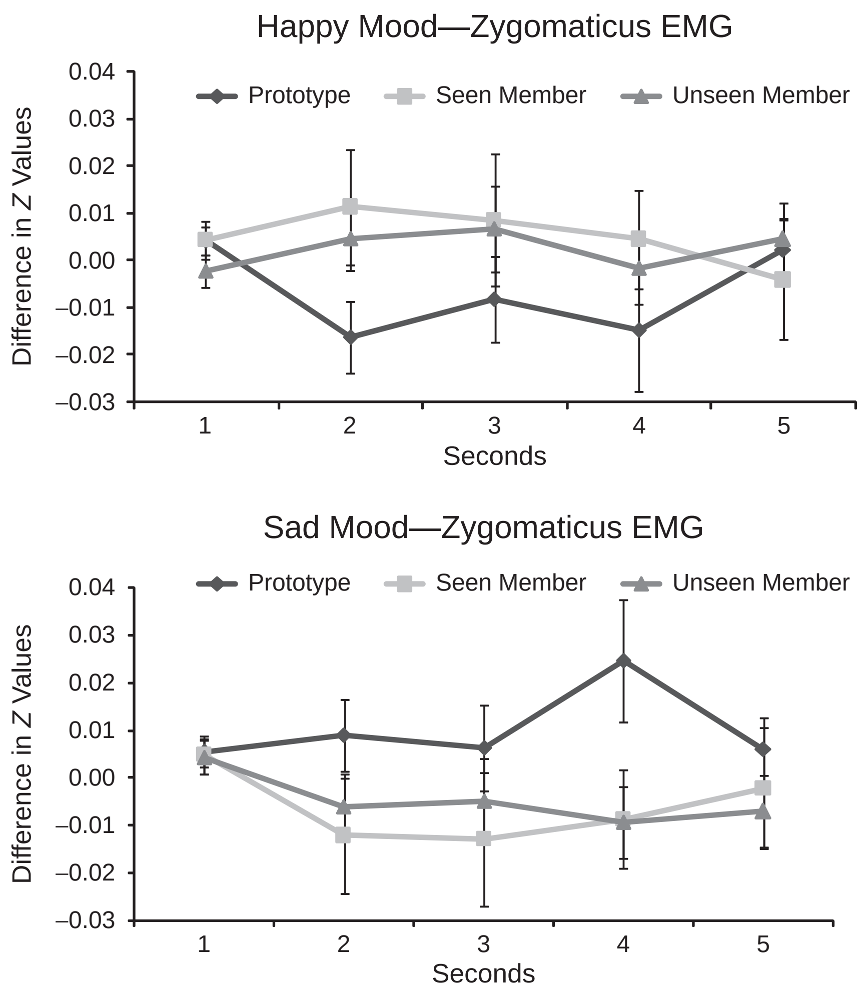

Fig. 3. Results for zygomaticus activity in Experiment 3. The graphs show electromyography (EMG) difference scores (exposed category – control category) as a function of time and stimulus type (prototype, seen member, unseen member). Results are shown separately for the happy mood condition (top panel) and the sad mood condition (bottom panel). Difference scores were calculated from *Z* scores (range: –3 to +3 *SD*). Error bars represent standard errors.

In sum, Experiment 3 showed that in a sad, but not in a happy, mood people prefer familiar patterns. The effects were most robust on prototypes, which elicited higher judgments and more smiling. Note that these hedonic changes occurred even though, as possibly suggested by SCR, the exposed patterns were more familiar in a happy than in a sad mood.

General Discussion

We explored how mood modulates the value of familiarity. Experiment 1 showed that under nonmanipulated mood conditions, participants preferred familiar stimuli, especially category prototypes. Results of Experiment 3 suggest that the positivity of familiarity depends on mood. Sad participants preferred and smiled at familiar prototypes. Happiness eliminated this preference on self-reports and EMG measures. An important point is that this was not due to happiness reducing familiarity itself. First, happy participants showed robust familiarity effects, even rating prototypes as older than did sad participants (Experiment 2). Second, the SCR findings suggest that familiarity was higher in a happy than in a sad mood (Experiment 3). In short, in happiness, familiarity is present, but it just does not glow warmly.

Before we interpret these results theoretically, some findings deserve discussion. First, in a neutral mood[4] (Experiment 1) and sad mood (Experiment 3), exposure influenced self-reported liking, with strongest effects occurring with prototypes and weaker effects occurring with seen and unseen items. As in earlier studies, exposure influenced EMG responses only to prototypes, but not to seen and unseen members (Winkielman et al., 2006). Thus, in our paradigm, the standard mere-exposure effect and structural mere-exposure effect were more fragile than the prototypicality effect. This might simply reflect that prototypicality is the strongest manipulation of familiarity or the underlying fluency. It is also possible that self-reports of preferences for seen and unseen members rely more on

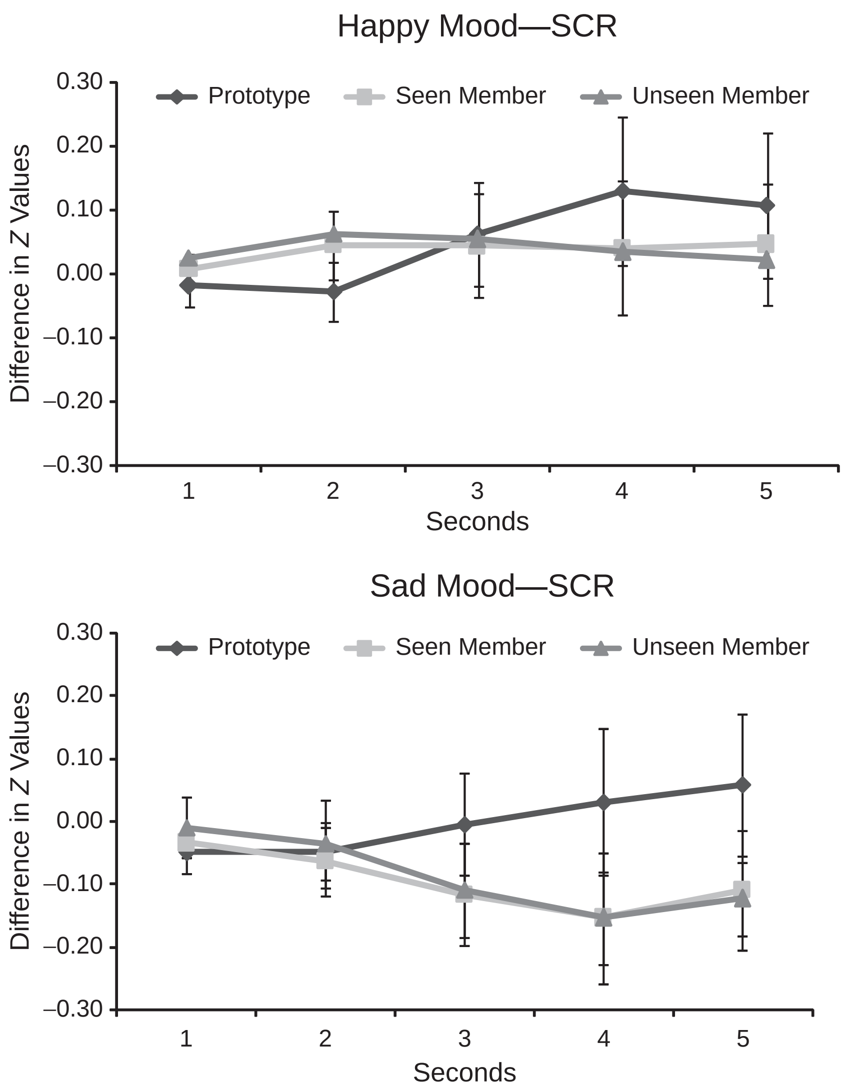

Fig. 4. Results for skin conductance response (SCR) in Experiment 3. The graphs show difference scores (exposed category – control category) as a function of time and stimulus type (prototype, seen member, unseen member). Results are shown separately for the happy mood condition (top panel) and the sad mood condition (bottom panel). Difference scores were calculated from *Z* scores (range: –3 to +3 *SD*). Error bars represent standard errors.

strategic inferences about category membership (Whittlesea, 2002). Second, as in earlier studies, the EMG effects for familiarity were limited to zygomaticus activity. This presumably indicates positivity of familiarity rather than negativity of novelty (Harmon-Jones & Allen, 2001; Winkielman & Cacioppo, 2001; Winkielman et al., 2006). Third, although we interpret SCR responses in this context as familiarity, other interpretations are possible, and in other contexts SCRs have been interpreted to indicate novelty, surprise, fear, excitement, and other mental states (Dawson et al., 2000; Zajonc 1968). More generally, feelings of familiarity and novelty might reflect context-sensitive interpretations of nonspecific arousal, which can be triggered by significant stimuli, both old and new (Goldinger & Hansen, 2005; Morris et al., 2008; Tranel & Damasio, 1985).

Turning to theoretical interpretations, our findings challenge proposals of a fixed link between familiarity and positivity. Instead, familiarity's value depends on affective context. This finding is consistent with tuning accounts of mood (e.g., Schwarz, 2002). If a mood signals an unsafe environment, familiarity is positive. If a mood signals a safe environment, familiarity loses its glow. Negative states strongly related to safety concerns, such as fear, might produce even stronger effects. Our results contain some (nonsignificant) hints that happiness boosts the value of the unfamiliar, perhaps supporting exploration via the "warm glow of novelty." An alternative explanation of our results is that happiness makes it harder for the "warm glow of familiarity" to shine through the sunny affective background. Our EMG results, reflecting spontaneous and early responses, speak somewhat against this subjective-discriminability interpretation, but future studies should test for salience of familiarity-induced affective changes. It is also worth exploring if enhancement of relational processing in happiness makes the "oldness" of the prototype more blatant and thus reduces its implicit exposure effects on preferences (Storbeck & Clore, 2005; Zajonc, 1968).

Our results resonate with proposals that hedonic reactions to familiarity are motivation dependent (see Harmon-Jones & Allen, 2001, for correlational evidence). For example, participants rate fluent (and presumably familiar) stimuli higher in a prevention versus promotion motivational focus (Freitas, Azizian, Travers, & Berry, 2005). This study left unanswered whether motivational focus changes actual fluency and familiarity, or only their hedonic implications. Our results suggest the latter. More generally, current results highlight that the hedonic implication of heuristic cues, such as familiarity, is context dependent (Hertwig et al., 2008).

Finally, an exciting feature of our results is that happiness can reduce positivity of prototypicality. Thus, the otherwise robust beauty-in-averageness effect appears sensitive to affective and motivational factors. This finding deserves exploration with faces and other objects that robustly show the classic effect. But for now, it appears that in a happy mood, prototypes are, well, just average.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interests with respect to their authorship and/or the publication of this article.

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Supplemental Material

Additional supporting information may be found at http://pss.sagepub.com/content/by/supplemental-data

Notes

1. The connection is bidirectional: Stimulus positivity also enhances stimulus familiarity (e.g., Monin, 2003).
2. Note that EMG activity was standardized within subjects across the entire length of the experiment, including the mood induction phase. Thus, the numerical differences in the dot-pattern rating phase are relatively small.
3. In keeping with the notion that happiness weakens the familiarity-positivity link, SCR (5-s average) and self-reported liking of prototypes were positively correlated in sadness ($p < .05$), but not in happiness ($p > .2$).
4. Nonmanipulated moods are usually slightly positive, on average, but less positive and more variable than experimentally induced positive moods.

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