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Happiness cools the 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-averages 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 to 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 (EMG indicator of spontaneous smiling). The basic effect of exposure on preference and its modulation by mood were most robust on 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

Liking for previously encountered stimuli, or the "warm glow of familiarity", is a classic phenomenon (Titchener, 1910). One source of "warm glow" is a simple repetition (Zajonc, 1968; 2001), with such "mere exposure" enhancing familiarity and liking (Whittlesea & Price, 2001).[1] This enhancement sometimes generalizes to new, but categorically similar exemplars (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).

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[1]The connection is robust that in reverse stimulus positivity enhances its familiarity (e.g., Monin, 2003; Phaf & Rotteveel, 2005).

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Prototypes are also highly liked, an effect called "*beauty-in-averages*" (Halberstadt, 2006). It occurs with a range of stimuli, including abstract patterns, faces, watches and cars, and dependent measures, including attractiveness ratings and psychophysiological responses (e.g., Langlois & Roggman, 1990; Halberstadt & Rhodes, 2000). For example, prototypes of a dot-pattern from an exposed versus novel category elicit more incipient "smiles" (Winkielman, Halberstadt, Fazendeiro, & Catty, 2006).

Familiarity and liking

But is familiarity always warm? Some accounts assume so. According to conditioning models, familiarity inevitably increases positivity because repeated exposure is a form of conditioning to the absence of negative consequences – associating the stimulus with relief from fear of novelty (Zajonc, 2001). Some hedonic fluency models assume that familiarity is intrinsically rewarding as it is associated with efficient and conflict-free processing (e.g., Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Finally, evolutionary models suggest that koinophilia (preference for common features) occurs because typicality is a cue to mate value (Thornhill & Gangestad, 1993).

In contrast, other accounts see the familiarity-positivity link as context dependent. Familiarity is a heuristic cue to safety. Thus, as with any cue, its validity and hedonic meaning varies by context (Hertwig, Herzog, Schooler, & Reimer, 2008). Specifically, the familiarity-positivity link should depend on whether individuals are tuned towards safety concerns (e.g., Bornstein, 1989). Familiarity should be valued in an unsafe environment, but less so in a benign environment. Analogously, in a strange city a familiar face elicits a warm glow, whereas locally the same face prompts a yawn. Numerous studies (and parents) observed that in unsafe environments infants are neophobic, but less so in safe settings (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 towards 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 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 genuine "hot" reactions to stimuli, but also "cold" judgments of stimulus properties (e.g., pattern "goodness" or inferences about previous occurrence). 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 detects affective responses to familiarity, with repeated stimuli and prototypes eliciting greater EMG activity over the cheek "smiling" region, but not over the brow "frowning" region (Harmon-Jones & Allen, 2001; Winkielman & Cacioppo, 2001; Winkielman et al., 2006).

We also measured skin conductance responses (SCR), which reflect sympathetic arousal. The psychological meaning of SCR varies with context. When distinct and task-relevant, familiar stimuli can trigger SCRs (Tranel & Damasio, 1985; Morris, Cleary & Still, 2008). However, sometimes novel, surprising or fearful stimuli can too (Dawson, Schell, & Filion, 2000). Importantly, SCR provides information about physiological 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), which minimizes problems inherent to meaningful stimuli (e.g., greater symmetry or prior experience with prototypes; Rhodes, Sumich, & Byatt, 1999). In the first "exposure phase" participants view fourteen converging distortions (i.e., "seen members") of a category prototype. Another, fifteenth distortion (i.e., "unseen member") and the prototype are not shown. In the subsequent "test phase", participants view six patterns: category prototype, seen member, unseen member, and three matched controls from an unexposed category. Participants rate each pattern on a continuous memory (confidence new/old) or a liking scale. See Figure 1, and the online supplement.

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

Pretests: Experiments 1 and 2

We conducted two behavioral pretests, described in the supplement. Figure 2 shows the results. Experiment 1 established that our procedure most robustly enhances self-reports of familiarity (1A) and liking (1B) of prototypes from exposed categories under non-manipulated mood conditions. Experiment 2 tested the mood effects on self-reports of familiarity. It showed that our procedure enhances familiarity of "new" prototypes from exposed categories under both mood conditions. Interestingly, prototypes were rated as particularly familiar in the positive compared to the negative mood condition, extending reports that happiness increases false memory for verbal prototypes (Storbeck & Clore, 2005). These pretest-results set the stage for the main experiment exploring mood modulation of affective implications of familiarity.

Experiment 3: Psychophysiological examination

The main experiment examined mood effects on reactions towards familiar stimuli using self-reports and EMG as measures of affect, and SCR as a measure of familiarity. We predicted that compared to a positive mood, a negative mood would result in a stronger preference for familiar stimuli, especially the prototype.

Method

Sixteen undergraduates participated for extra credit. We first determined their resting, pre-manipulation (10-second period) physiological baselines. Next, we manipulated mood by instructing participants to focus on and describe a happy (or sad) autobiographical memory. We checked mood state on a 7-point scale. To maintain mood, participants subsequently listened to music (cf. Experiment 2). Again, we measured resting activity (10-second period), which served as a physiological mood-manipulation check (see supplement for details about data-recording and data-reduction).

Results and Discussion

Mood-manipulation check—On ratings, a Mood-Gender ANOVA revealed only a main effect, with participants reporting feeling better in the happy ($M = 5.50$) than sad ($M = 3.75$) condition, $F(1,15) = 7.08$, $p < .01$. Mood also influenced physiology. Specifically, for EMG, an ANOVA with Mood, Muscle (zygomaticus/corrugator), Time (10 seconds), and Gender, revealed a Muscle-Mood-Time interaction, $F(9,108) = 2.29$, $p < .03$, $\eta_p 2 = .16$, driven by a significant Mood-Time interaction on the corrugator, $F(9,108) = 3.76$, $p < .01$. In the later five seconds, sad participants showed greater corrugator than zygomaticus activity, $t(7)$, = 3.63, $p < .01$. Analyses of SCR, a non-specific 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.

Self-reports of liking—Figure 2 shows how familiarity influenced liking in different moods. ANOVA with Mood and StimulusType (prototype/seen/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" (*t*s = 1.7, $p < .14$). 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 (*t*s < 1).

EMG—A Mood-StimulusType-Time (1–5 seconds after stimulus onset) ANOVA revealed a significant 3-way interaction for cheek activity (smiling), $F(8,112) = 2.10$, $p < .05$, $\eta_p 2 = .13$. Figure 3 shows a difference in zygomaticus response to old vs. control prototypes. The response was significantly larger in the sad than the happy mood condition as early as two seconds after stimulus onset, peaking at the fourth second and then disappearing by fifth second (*p*s < or = .05). There were no effects on "seen" and "unseen" items. As in earlier studies, no familiarity effects were obtained for frowning EMG – we return to this issue in the discussion.

SCR—A Mood-StimulusType-Time (1–5 seconds) ANOVA, revealed a main effect of mood, $F(1,14) = 22.01$, $p < .001$. Figure 4 (top vs. bottom) 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 two seconds. There was no Mood-StimulusType interaction. However, Time interacted with StimulusType, such that after two seconds, prototypes elicited stronger responses than other patterns, $F(8,112) = 2.02$, p=.05.[2]

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." Interestingly, these hedonic changes occurred despite the fact that, as possibly suggested by SCR, the exposed patterns were more familiar in a happy than a sad mood.

General Discussion

We explored how mood modulates the value of familiarity. Experiment 1 shows that under non-manipulated mood conditions, participants prefer familiar stimuli, especially category prototypes. Experiment 3 suggests that the positivity of familiarity depends on mood. Sad participants preferred and "smiled to" familiar prototypes. Happiness eliminated this preference on self-reports and EMG measures. Importantly, this was not due to happiness reducing familiarity itself. First, happy participants showed robust familiarity effects, even rating prototypes as "older" than sad participants (Experiment 2). Second, one reading of SCR findings is that familiarity was higher in a happy than 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[3] (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 for seen and unseen members rely more on 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 (Zajonc 1968;Dawson et al, 2000). More generally, feelings of familiarity and novelty reflect context-sensitive interpretations of non-specific 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 familiarity-positivity link. Instead, familiarity's value depends on affective context, 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 (non-significant) hints that happiness boosts the value of novelty, perhaps supporting exploration via the "warm glow of the unfamiliar." An

[2]Consistent with the notion that happiness loosens the familiarity-positive link, SCR (5 sec average) and liking of prototypes was positively correlated ($p < .05$) in happiness, but not in sadness ($p > .2$).

[3]Non-manipulated moods are usually slightly positive on average, but less positive and more variable than experimentally induced positive moods.

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 prototype more salient and thus reduces its implicit exposure effects (Zajonc, 1968, Storbeck & Clore, 2005).

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 vs. promotion focus (Freitas, Azizian, Travers, & Berry, 2005). Their study left unanswered whether motivational focus changes fluency/familiarity itself, or its hedonic implications, but our results suggest the latter. More generally, current results highlight that 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-averages" 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.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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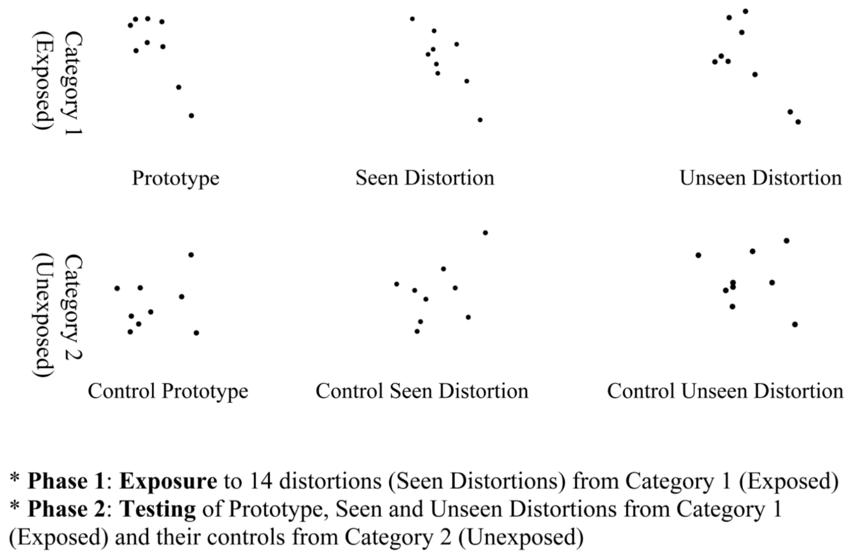

Figure 1.
Materials (examples of dot patterns used: Prototype, Seen Distortion and Unseen Distortion from exposed Category 1 and their controls from Category 2) and procedure (Phase 1: "Exposure" & Phase 2: "Testing") of the random-dot-pattern paradigm.

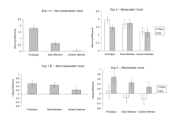

Figure 2.
Means and standard errors of memory and liking judgments as a function of stimulus type and mood for Experiments 1A/B, 2, and 3. Liking rating scale: 1 (not at all) to 9 (very much), memory rating scale: 1 (confident new) to 8 (confident old).

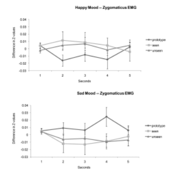

Figure 3.
Means and standard errors of EMG activity as a function of stimulus type (prototype, seen distortion and unseen distortion) for a happy and sad mood.

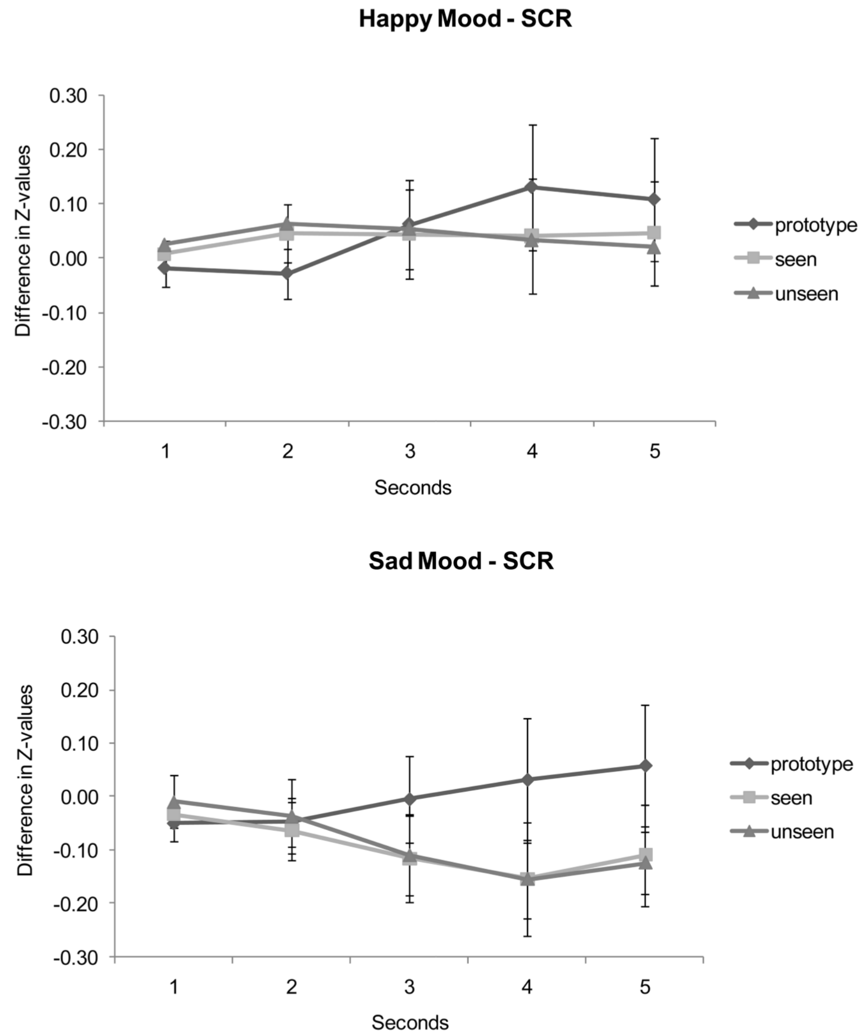

Figure 4.

Means and standard errors of SCR as a function of stimulus type (prototype, seen distortion and unseen distortion) for a happy and sad mood.