

## Contextual Positivity-Familiarity Effects Are Unaffected by Known Moderators of Misattribution

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The positivity-familiarity effect refers to the phenomenon that positive affect increases the likelihood that people judge a stimulus as familiar. Drawing on the assumption that positivity-familiarity effects result from a common misattribution mechanism that is shared with conceptually similar effects (e.g., fluency-familiarity effects), we investigated whether positivity-familiarity effects are qualified by three known moderators of other misattribution phenomena: (a) conceptual similarity between affect-eliciting prime stimuli and focal target stimuli, (b) relative salience of affect-eliciting prime stimuli, and (c) explicit warnings about the effects of affect-eliciting prime stimuli on familiarity judgments of the targets. Counter to predictions, three experiments obtained robust positivity-familiarity effects that were unaffected by the hypothesized moderators. The findings pose a challenge for misattribution accounts of positivity-familiarity effects, but they are consistent with alternative accounts in terms of affective monitoring.

Keywords: affect, familiarity, fluency, misattribution, priming

The positivity-familiarity effect refers to the phenomenon that positive affect increases the likelihood that people judge a stimulus as familiar (e.g., Corneille et al., 2005; Garcia-Marques et al., 2004; Housley et al., 2010; Monin, 2003; Phaf & Rotteveel, 2005). A central idea in research on this effect is that, because familiarity evokes positive affect (e.g., Zajonc, 1968), people may show a reverse tendency to infer familiarity from positive affect (e.g., Monin, 2003). As such, the positivity-familiarity effect can be interpreted as a reversed mere-exposure effect (Rotteveel & Phaf, 2007). Positivity-familiarity effects occur even when positive affect is elicited by a contextual factor rather than the focal target stimulus (e.g., Claypool et al., 2008; Duke et al., 2014; Garcia-Marques et al., 2004; Housley et al., 2010; Phaf & Rotteveel, 2005). Such effects have been found when positive affect was elicited by subliminal presentations of smiley faces (Garcia-Marques et al., 2004), supra- and subliminal presentations of positive words (Phaf & Rotteveel, 2005), contraction of the zygomaticus muscle (Phaf & Rotteveel, 2005), and reading an article designed to induce positive mood (Claypool et al., 2008).

One explanation for contextual positivity-familiarity effects is that they result from a common misattribution mechanism (Loersch & Payne, 2011) shared with various other phenomena, such as fluency-familiarity effects (Jacoby & Kelley, 1987; Jacoby & Whitehouse, 1989; Whittlesea & Williams, 2000, 2001). For example, the Situated Inference Model (SIM; Loersch & Payne, 2011) suggests that, when people are faced with the question of whether a specific target is familiar, they rely on momentarily

accessible contents (e.g., experienced ease of processing, feeling of positivity) if they attribute these contents to their perception of the target. However, accessibility of specific content can also be the result of a contextual prime, and such contents are sometimes misattributed to one's own response to the target. It has been shown that positive affect and processing fluency show parallel effects on judgments of familiarity, suggesting that people interpret experienced positivity as signaling familiarity, similarly to experienced fluency (Duke et al., 2014).

In the present research, we were interested in the boundary conditions of contextual positivity-familiarity effects to better understand when positivity is interpreted as signaling familiarity. Based on the assumption that contextual positivity-familiarity effects result from a common misattribution mechanism that is shared with conceptually similar effects (e.g., fluency-familiarity effects; see Winkielman et al., 2003), we tested whether three known moderators of other misattribution phenomena also moderate contextual positivity-familiarity effects.

First, we tested whether conceptual similarity between the contextual source of positive affect (i.e., prime stimulus) and the focal target moderates positivity-familiarity effects. Previous research suggests that misattribution of prime features to a focal target increases with increasing conceptual similarity between prime and target (e.g., Ecker & Bar-Anan, 2019a, 2019b). Thus, high conceptual similarity between an affect-eliciting prime and a focal target might similarly promote a misattribution of prime-related affect to the familiarity of the target. In line with this idea, the SIM (Loersch & Payne, 2011)

suggests that priming effects depend on how easily primed content is confused with one's own response to the target. Accordingly, increased conceptual similarity between prime and target might also increase the likelihood that positive affect elicited by a prime is misattributed to one's perception of the target. However, contrary to this hypothesis, conceptual similarity between primes and targets did not moderate positivity-familiarity effects in the current research.

Second, we tested whether the relative salience of positive affect moderates positivity-familiarity effects. Previous research suggests that fluency influences judgments of familiarity only when experienced fluency is surprising in the sense that it deviates from a benchmark of expected fluency (Whittlesea & Leboe, 2003). An important aspect in this regard is the relative salience of fluency, in that judgmental effects of fluency are more pronounced when instances of fluent processing are relatively rare (see Westerman, 2008; Whittlesea & Williams, 2001). Thus, given the close relation between positivity-familiarity and fluency-familiarity effects (Winkielman et al., 2003), relative salience of experiencing positive affect might similarly moderate positivity-familiarity effects. In line with this idea, the SIM (Loersch & Payne, 2011) suggests that, even when contextually primed content is confused with one's own reaction to a target, a priming effect might occur only when the primed content itself is relatively salient. Thus, only when experienced positivity deviates from a benchmark of expected positivity, it might be sufficiently salient to influence judgments about the familiarity of the target. Yet, contrary to this hypothesis, relative salience of positive primes did not moderate positivity-familiarity effects in the current research.

Third, we tested whether positivity-familiarity effects are influenced by explicit warnings about the biasing effect of affect-eliciting prime stimuli on familiarity judgments of the targets. Previous research suggests that knowledge about the effect of a contextual prime on judgments of a focal target reduce misattributions of prime features to the target (e.g., Gellatly et al., 1995; Jones et al., 2009; Oikawa et al., 2011; Ruys, et al., 2012; White & Knight, 1984). Thus,

knowledge about the effect of an affect-eliciting prime on familiarity judgments of a focal target might similarly reduce positivity-familiarity effects. In line with this idea, the SIM (Loersch & Payne, 2011) suggests that knowledge about the true cause of momentarily accessible content (e.g., prime stimulus) decreases confusion between prime-related content and one's own response to the target, rendering it is less likely that primed content is used to judge a focal target. Yet again, contrary to this hypothesis, explicit warnings about the effect of affect-eliciting primes on familiarity judgments of the targets did not moderate positivity-familiarity effects in the current research.

Collectively, the obtained results pose a challenge for accounts that attribute positivity-familiarity effects to a common misattribution mechanism shared with conceptually similar effects. Yet, the findings are consistent with alternative accounts that attribute positivity-familiarity effects to affective monitoring processes. We will discuss the latter in more detail in the General Discussion.<sup>1</sup>

### Experiment 1

Experiment 1 investigated whether positivity-familiarity effects are moderated by conceptual similarity between primes and targets. According to Ecker and Bar-Anan (2019a, 2019b), semantic properties related to the source of activated mental contents play a central role in misattribution effects, in that source confusion is more likely to occur when there is conceptual overlap between the source of activated mental contents and the target. With respect to the positivity-familiarity effect, conceptual overlap is generally high if positive affect is elicited by the focal object that has to be judged in terms of its familiarity (e.g., Corneille et al., 2005; Monin, 2003). However, if positive affect is elicited by a contextual stimulus (e.g., Garcia-Marques et al., 2004; Phaf & Rotteveel, 2005), confusion about the source of positive affect might be greater when the target has features that are conceptually related to the affect-eliciting prime. To test whether source-target similarity moderates positivity-familiarity effects, we manipulated the conceptual overlap between prime and target stimuli. Specifically, we manipulated the

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<sup>1</sup> All experiments reported below were approved by the ethics committee of the University of Hull, and informed consent was obtained before participants started the task. Based on earlier studies with a similar paradigm (Weil et al., 2020), the sample size for each study was determined beforehand with the requirement of 75 participants per cell in Experiment 1 and 2, and 90 participants per cell in Experiment 3 to compensate for participants who incorrectly answered a set of comprehension questions (see below). Data

collection was stopped once the required sample size was reached. Slightly larger samples resulted from participants who completed the experiment but did not request their compensation immediately after the study. If these participants asked for their compensation later, it was granted retroactively. The data for each experiment were collected in one shot without prior statistical analyses. We report all data exclusions, all manipulations, and all measures. All materials, data, and analysis codes are available at <https://osf.io/cbr84/>.

overlap of conceptual features by varying the similarity of semantic properties of the primes (i.e., face) and the targets (i.e., face or ideograph). In the high similarity condition, we used pictures of happy and sad faces as primes, and schematic faces as target stimuli. In the low similarity condition, we used Chinese ideographs instead of schematic faces as target stimuli. Based on previous findings (e.g., Ecker & Bar-Anan, 2019a, 2019b), we predicted that positivity-familiarity effects should be more pronounced in the high similarity condition compared to the low similarity condition.

## Methods

**Participants and Design.** Three-hundred-eight participants (142 female, 159 male, 7 not reported;  $M_{age} = 35.87$ ,  $SD_{age} = 11.51$ ) were recruited via Prolific Academic (see Palan, & Schitter, 2018; Peer et al., 2017) to participate in a study on “visual distraction and judgment.” Participants were eligible to sign up for the experiment only if (a) their country of residence was registered as the United States, (b) they had completed at least 10 studies on Prolific Academic, and (c) held an approval record of at least 95%. Participants were paid £0.84 (approx. \$1.00) for their participation. The study consisted of a 2 (Prime Valence: positive vs. negative)  $\times$  2 (Prime-Target Similarity: high vs. low) mixed design, with the first factor being manipulated within-participants and the second one between-participants. Stimulus presentation and response collection were controlled by Inquisit Web 5.0.11.0.

**Procedure.** Depending on the condition, the study was introduced as being concerned with either familiarity judgments of schematic faces (high prime-target similarity) or with familiarity judgments of Chinese ideographs (low prime-target similarity). Participants were informed that an image of a real face would briefly appear before the schematic face/Chinese ideograph, and that they do not have to respond to the image of the real face. They were further instructed not to let their reactions to the real faces influence their judgments of the schematic faces/Chinese ideographs (see Payne et al., 2005). In particular, they were told to indicate for each schematic face/Chinese ideograph whether it seems familiar or unfamiliar. On each trial of the task, participants were first presented with a warning signal (+++) for 500ms, which was replaced by a prime stimulus of either positive or negative valence (image of a happy or sad face) for 75ms. The presentation of the prime was followed by a blank screen for 125ms, after which a target (schematic face/Chinese ideograph) appeared for 100ms. The target was then replaced by a pattern mask, and participants were asked to indicate whether the target seems familiar or unfamiliar to them. The pattern mask remained on the

screen until participants gave their response. The next trial started immediately afterwards.

As prime stimuli, we used 36 images of happy faces and 36 images of sad faces. Images were taken from different face databases (Ebner et al., 2010; Langer et al., 2010; Ma et al., 2015; Olszanowski et al., 2015; Van der Schalk et al., 2011) and edited such that all faces had a similar appearance. All faces were presented against a white background. Each prime was presented once, summing up to a total of 72 trials. In the low prime-target similarity condition, the targets were 72 Chinese ideographs taken from Payne et al. (2005). For the high prime-target similarity condition, we created 72 neutral schematic faces as target stimuli. Toward this end, we selected neutral faces from a dataset of trustworthy, untrustworthy and neutral faces (Oosterhof & Todorov, 2008) and edited them to give them a blurred, pixelated appearance (see Figure 1; see also Krieglmeyer & Sherman, 2012). Order of trials and prime-target pairings were randomized for each participant. In line with the instructions by Payne et al. (2005), participants were told that they should try their best not to let the images of real faces bias their judgments of the schematic faces/Chinese ideographs.

After completing the main task, participants were presented with a post-experimental demographic questionnaire, which included several questions on whether they performed the task alone, uninterrupted and without any help, and whether they had any educated guess concerning the purpose of the experiment.

## Results

Data from eight participants were incomplete and excluded from the analysis. Following procedures by Weil et al. (2017, 2020), we also excluded data from 39 participants who used the same response key on more than 90% of the trials. The remaining sample included 12 participants who reported knowledge of Chinese languages. Excluding these participants did not change the general pattern of results. These participants are therefore retained in the following analysis, which is based on 261 participants. Sensitivity analyses (GPower 3.1.9.2; Faul et al., 2007) revealed that the experiment ( $N = 261$ ) had a power of  $(1-\beta) = .80$  in detecting effect sizes of  $\eta_p^2 > .03$ , and a power of  $(1-\beta) = .90$  in detecting effect sizes of  $\eta_p^2 > .04$  for an interaction effect in a  $2 \times 2$  mixed ANOVA (two-tailed). The proportion of *familiar* (vs. *unfamiliar*) responses towards the target stimuli served as the dependent variable. A 2 (Prime Valence: positive vs. negative)  $\times$  2 (Prime-Target Similarity: high vs. low) mixed ANOVA revealed a significant main effect of Prime Valence,  $F(1, 259) = 9.07$ ,  $p = .003$ ,  $\eta_p^2 = .03$ , indicating that the targets were judged more frequently as familiar when they followed a positive prime ( $M = .49$ ,  $SD = .21$ , 95% CI [.47, .52])

than when they followed a negative prime ( $M = .46$ ,  $SD = .19$ , 95% CI [.43, .48]) (see Figure 2). Moreover, a significant main effect of Prime-Target Similarity indicated that Chinese ideographs were judged as less familiar ( $M = .43$ ,  $SD = .18$ , 95% CI [.40, .46]) than schematic faces ( $M = .52$ ,  $SD = .17$ , 95% CI [.49, .55]),  $F(1, 259) = 17.01$ ,  $p < .001$ ,  $\eta_p^2 = .06$  (see Figure 2). Counter to our predictions, the interaction of Prime Valence and Prime-Target Similarity was not statistically significant,  $F(1, 259) = .97$ ,  $p = .33$ ,  $\eta_p^2 = .00$ . If anything, the effect of Prime Valence was somewhat weaker in the high similarity condition compared to the low similarity condition (see Figure 2).

To quantify the evidence for the presence or absence of a given effect, we calculated Bayes factors (BF) using JASP (2019). We adopted the convention that  $BF_{10} = 1$  implies lack of any evidence (i.e., the data are as likely to occur under  $H_0$  as under  $H_1$ ),  $1 < BF_{10} \leq 3$  implies anecdotal evidence for  $H_1$ ,  $3 < BF_{10} \leq 10$  implies moderate evidence for  $H_1$ ,  $10 < BF_{10} \leq 30$  implies strong evidence for  $H_1$ ,  $30 < BF_{10} \leq 100$  implies very strong evidence for  $H_1$  and  $BF_{10} > 100$  implies decisive evidence for  $H_1$  (Jeffreys, 1961; Lee & Wagenmakers, 2013). Conversely,  $.30 < BF_{10} \leq 1$  implies anecdotal evidence for  $H_0$ ,  $.10 < BF_{10} \leq .30$  implies moderate evidence for  $H_0$ ,  $.03 < BF_{10} \leq .10$  implies strong evidence for  $H_0$ ,  $.01 < BF_{10} \leq .03$  implies very strong evidence for  $H_0$  and  $BF_{10} < .01$  implies decisive evidence for  $H_0$ . All Bayesian analyses reported in the following were run with a default prior (i.e.,  $r = 0.5$  for fixed effects). To gauge the sensitivity to prior specifications, we ran the same analyses again with a wider (i.e.,  $r = 1$  for fixed effects) and a more narrow prior (i.e.,  $r = 0.2$  for fixed effects). The results of these analyses were not qualitatively different from the initial results when the default prior was used. The results of the Bayesian analyses are presented in Table 1. There was moderate evidence for an effect of Prime Valence, decisive evidence for an effect of Prime-Target Similarity, and moderate evidence for a null effect of the predicted interaction between Prime Valence and Prime-Target Similarity.

### Discussion

Experiment 1 did not confirm our hypothesis that prime-target similarity influences positivity-familiarity effects. Positive primes led to a higher proportion of familiar judgments, regardless of the degree of conceptual similarity between prime and target. Given previous evidence for the idea that source confusion, and thus misattribution of prime features to targets, increases as a function of conceptual similarity between primes and targets (e.g., Ecker & Bar-Anan, 2019a, 2019b), it seems surprising that prime-target similarity did not moderate positivity-familiarity effects in the current study.

Instead, the results of Experiment 1 suggest that the occurrence of positivity-familiarity effects is independent of the degree of conceptual feature overlap between the source of positivity and the target judged for its familiarity.

### Experiment 2

Experiment 2 investigated whether positivity-familiarity effects are moderated by the relative salience of experienced positive affect. Previous research suggests that fluency effects are relative because they are sensitive to expectations of experienced fluency (Westerman, 2008; Westerman et al., 2002). That is, fluency influences judgments of familiarity only when experienced fluency is surprising in the sense that it deviates from a benchmark of expected fluency (Whittlesea & Leboe, 2003). Thus, to the extent that positive affect and processing fluency show parallel effects on judgments of familiarity (Duke et al., 2014), expectations about the experience of positive affect might similarly moderate positivity-familiarity effects. The main goal of Experiment 2 was to test this hypothesis. Toward this end, we manipulated the relative frequency of positive and neutral primes, assuming that neutral primes provide a benchmark and lower (higher) frequency of positive primes increases (decreases) the salience of positive affect, which in turn should enhance (reduce) positivity-familiarity effects.

### Methods

**Participants and Design.** Three-hundred-four participants (133 female, 166 male, 4 other, 1 not reported;  $M_{age} = 36.00$ ,  $SD_{age} = 12.62$ ) were recruited via Prolific Academic. Eligibility for participation was limited to individuals who had not participated in Experiment 1. The compensation and all eligibility criteria were identical to Experiment 1. The study consisted of a 2 (Prime Valence: positive vs. neutral)  $\times$  2 (Salience of Positivity: high vs. low) mixed design, with the first factor being manipulated within-participants and the last one between-participants.

**Procedure.** The study was introduced as being concerned with familiarity judgments of Chinese ideographs. Participants were informed that real-life images would briefly appear before Chinese ideographs. All other instructions and procedural parameters were identical to Experiment 1. As prime stimuli, we used 50 positive and 80 neutral images from the International Affective Picture System (IAPS; Lang et al., 2008). Using Lang et al.'s (2008) normative data, the positive primes had a mean valence rating of  $M_{val} = 7.63$  ( $SD_{val} = .35$ ); the neutral primes had a mean valence rating of  $M_{val} = 4.87$  ( $SD_{val} = .32$ ). Salience was manipulated via the relative frequency of positive and neutral primes. In the low salience condition, positive and neutral primes

appeared with an equal frequency (50 positive, 50 neutral). In the high salience condition, positive primes were presented less frequently than neutral primes (20 positive, 80 neutral), making the positive primes more salient. As target stimuli, we used 100 Chinese ideographs from Payne et al. (2005). Each prime-target combination was presented once, summing up to a total of 100 trials. Order of trials and prime-target pairings were randomized for each participant. The analysis is based on 40 focal trials with the same positive and neutral primes irrespective of the salience condition. Half of these trials included a positive prime; half included a neutral prime.

### Results

Data from two participants were incomplete and excluded from the analysis. Following procedures by Weil et al. (2017, 2020), we also excluded data from 50 participants who used the same response key on more than 90% of the trials. The remaining sample included 18 participants who reported knowledge of Chinese languages. Excluding these participants did not change the general pattern of results. These participants are therefore retained in the following analysis, which is based on 252 participants. Sensitivity analyses (GPower 3.1.9.2; Faul et al., 2007) revealed that the experiment ( $N = 252$ ) had a power of  $(1-\beta) = .80$  in detecting effect sizes of  $\eta_p^2 > .03$ , and a power of  $(1-\beta) = .90$  in detecting effect sizes of  $\eta_p^2 > .04$  for an interaction effect in a  $2 \times 2$  mixed ANOVA (two-tailed). The proportion of *familiar* (vs. *unfamiliar*) responses on the 40 focal trials served as the dependent variable. A  $2$  (Prime Valence: positive vs. neutral)  $\times 2$  (Salience of Positivity: high vs. low) mixed ANOVA revealed a significant main effect of Prime Valence,  $F(1, 250) = 6.62, p = .011, \eta_p^2 = .03$ , showing that the targets were more frequently judged as familiar when they followed a positive prime ( $M = .46, SD = .22, 95\% \text{ CI } [.44, .49]$ ) than when they followed a neutral prime ( $M = .43, SD = .19, 95\% \text{ CI } [.41, .46]$ ) (see Figure 3). Counter to our predictions, the interaction of Prime Valence and Salience was not statistically significant,  $F(1, 250) = .03, p = .85, \eta_p^2 = .00$  (see Table 2). Bayesian analyses revealed anecdotal evidence for an effect of Prime Valence and moderate evidence for a null effect of the predicted interaction between Prime Valence and Salience of Positivity (see Table 2).

### Discussion

Contrary to our predictions, the salience of positivity did not moderate positivity-familiarity effects. This finding suggests that, despite the available evidence for parallel effects of positivity and fluency on judgments of familiarity (Duke et al., 2014), one known moderator of fluency effects, relativity of experience (see Westerman, 2008; Whittlesea & Leboe, 2003; Whittlesea & Williams,

2001), does not moderate positivity-familiarity effects to the same extent.

### Experiment 3

Experiment 3 investigated whether positivity-familiarity effects are moderated by explicit warnings about the effects of prime-related positive affect on familiarity judgments of the targets. Previous research suggests that misattribution effects are reduced or eliminated when participants can identify the true source of their reactions (e.g., Gellatly et al., 1995; Jones, et al., 2009; Oikawa, et al., 2011; Ruys, et al., 2012; White & Knight, 1984). Thus, knowledge about the effect of primes (i.e., true source of positivity) on familiarity judgment of the targets may help participants to correct their familiarity judgments for biasing effects of the primes. In line with the discounting principle (Kelley, 1971), the role of target familiarity as a cause of positive affect should be discounted when another cause for positive affect (i.e., prime) is present. Based on these assumptions, we hypothesized that warning participants about the effects of prime valence on the familiarity judgments of the targets should reduce or eliminate the positivity-familiarity effect (see also Verwijmeren et al., 2013). To test this hypothesis, we explicitly warned participants that the positivity of the prime might influence their familiarity judgments and compared positivity-familiarity effects in this condition to a control condition in which participants received a more general warning not to be influenced by the primes.

### Methods

**Participants and Design.** Three-hundred-seventy participants (171 female, 181 male, 3 other, 15 not reported;  $M_{age} = 36.01, SD_{age} = 13.17$ ) were recruited via Prolific Academic. Eligibility for participation was limited to individuals who had not participated in Experiments 1 and 2. The compensation and all eligibility criteria were identical to Experiments 1 and 2. The study consisted of a  $2$  (Prime Valence: positive vs. negative)  $\times 2$  (Warning: explicit vs. general) mixed design, with the first factor being manipulated within-participants and the last one between-participants.

**Procedure.** The procedure was identical to Experiment 2 with the following exceptions: In the explicit warning condition, participants were warned explicitly about the influence of prime valence on familiarity judgments of the targets. Specifically, they were told that “having just seen a real-life image can influence your judgment of the Chinese ideographs. Pleasant images are known to elicit positive, warm feelings. Such positive reactions can increase feelings of familiarity.” They were asked to try their best not to let the reactions to the real-life images influence their

judgments of the Chinese ideographs. In the general warning condition, participants were only asked to try their best not to let the reactions to the real-life images influence their judgments of the Chinese ideographs without receiving any additional information about how the primes might influence their judgments of the targets. To ensure that participants read and understood the instructions in both conditions, the instructions were followed by three multiple-choice items. Participants were asked to complete the sentence “My task is to judge...” by distinguishing between the correct option (i.e., “the familiarity of Chinese ideographs”) and the incorrect option (i.e., “the familiarity of real-life images”) and to complete the sentence “I should try my best...” by distinguishing between the correct option (i.e., “not to be influenced by the real-life images”) and the incorrect option (i.e., “not to be influenced by the Chinese ideographs”). The beginning of the third sentence was identical in both conditions (i.e., “I was told that...”) but the correct options differed for the two conditions. In the explicit warning condition, the correct option read “Pleasant images can increase feelings of familiarity” and had to be distinguished from the incorrect option (i.e., “Pleasant images do not have any influence”). In the general warning condition, the correct option read “Chinese ideographs will be shown very briefly” and had to be distinguished from the incorrect option (i.e., “Chinese ideographs will be shown as long as I need to make a decision”). For all three sentences, participants were also given the option to indicate that they are not sure which is the correct answer.

As prime stimuli, we used 36 positive and 36 negative images from the IAPS (Lang, et al., 2008). Using Lang et al.’s (2008) normative data, the positive primes had a mean valence rating of  $M_{\text{val}} = 7.71$  ( $SD_{\text{val}} = .35$ ); the negative primes had a mean valence rating of  $M_{\text{val}} = 3.36$  ( $SD_{\text{val}} = .51$ ). As target stimuli, we used 72 Chinese ideographs from Payne et al. (2005). Each prime-target combination was presented once, summing up to a total of 72 trials. Order of trials and prime-target pairings were randomized for each participant.

## Results

Two participants completed the experiment twice and were excluded from the analysis. Participants with incomplete data ( $N = 17$ ) were not included in the analysis. Following procedures by Weil et al. (2017, 2020), participants who used the same response key on more than 90% of the trials ( $N = 51$ ) were excluded. Excluding participants who did not select the correct answer for all three comprehension sentences ( $N = 59$ ) did not change the result pattern. These participants are therefore retained. The remaining sample included 21 participants who reported knowledge of Chinese languages. Excluding these participants did not change

the general pattern of results and they are therefore retained in the following analysis, which is based on 300 participants. Sensitivity analyses (GPower 3.1.9.2; Faul et al., 2007) revealed that the experiment ( $N = 300$ ) had a power of  $(1-\beta) = .80$  in detecting effect sizes of  $\eta_p^2 > .03$ , and a power of  $(1-\beta) = .90$  in detecting effect sizes of  $\eta_p^2 > .03$  for an interaction effect in a  $2 \times 2$  mixed ANOVA. The proportion of *familiar* (vs. *unfamiliar*) responses towards 72 Chinese ideographs served as the dependent variable. A  $2$  (Prime Valence: positive vs. negative)  $\times 2$  (Warning: explicit vs. general) mixed ANOVA revealed a significant main effect of Prime Valence,  $F(1, 298) = 15.70, p < .001, \eta_p^2 = .05$ , showing that the targets were more frequently judged as familiar when they followed a positive prime ( $M = .45, SD = .22, 95\% \text{ CI } [.43, .48]$ ) than when they followed a negative prime ( $M = .41, SD = .19, 95\% \text{ CI } [.38, .43]$ ) (see Figure 4). Counter to our predictions, the interaction of Prime Valence and Warning was not statistically significant,  $F(1, 298) = .49, p = .48, \eta_p^2 = .00$  (see Table 3). Bayesian analyses revealed decisive evidence for an effect of Prime Valence and moderate evidence for a null effect of the predicted interaction between Prime Valence and Warning (see Table 3).

## Discussion

Results from Experiment 3 did not confirm our hypothesis that explicitly warning participants about the effect of prime valence on familiarity judgments of the targets moderates positivity-familiarity effects. Positive primes led to more familiar judgments than negative primes regardless of whether participants received an explicit or a general warning. Thus, positive affect seems to cue judgments of familiarity even when the source of this positive affect is known. This finding stands in contrast to a central assumption of extant theories of misattribution, suggesting that source confusion is a driving force behind misattribution effects (e.g., Jones, et al., 2009; Loersch & Payne, 2011; Oikawa, et al., 2011).

## General Discussion

The aim of the present research was to investigate theoretically derived boundary conditions of contextual positivity-familiarity effects to better understand when positivity influences judgments of familiarity. To this end, we investigated whether known moderators of phenomena that have been explained in terms of a shared misattribution mechanism also influence positivity-familiarity effects. Experiment 1 tested whether source-target similarity moderates effects of positive primes on judgments of familiarity. Counter to our predictions, positive primes led to a higher proportion of familiar judgments regardless of whether conceptual similarity between the primes and targets was high or low.

Experiment 2 investigated whether the salience of experiencing positive affect moderates positivity-familiarity effects. Again, counter to our predictions, salience of positivity did not moderate positivity-familiarity effects, in that positive primes increased judgments of familiarity regardless of whether salience of positivity was high or low. Finally, Experiment 3 investigated whether warning participants about the effect of prime valence on familiarity judgment of the targets influences positivity-familiarity effects. Again, counter to our predictions, positive primes led to more familiar judgments than negative primes regardless of whether participants received an explicit or a general warning. Together, these findings call into question commonalities between the positivity-familiarity effect and phenomena that have been explained in terms of a shared misattribution mechanism.

Failures to find significant effects of the three moderators can be due to insufficient statistical power (see Maxwell et al., 2015). The current research used relatively large sample sizes (total  $N = 813$ ) to ensure sufficient statistical power in identifying potentially small effects. Each experiment was sensitive to detect effect sizes of  $\eta_p^2 > .03$  for the main statistical effect of interest with a power of .80. Moreover, Bayesian analyses (Jeffreys, 1961; Lee & Wagenmakers, 2013) revealed moderate evidence for the absence of a moderation effect in all three experiments. Thus, although we cannot rule out that our studies were underpowered for the detection of rather small effects of the three moderators ( $\eta_p^2 < .03$ ), a valid conclusion is that their impact on positivity-familiarity effects seems to be much less pronounced than suggested by prior research and extant theories of misattribution (if they have any impact at all).

To the extent that the differential impact of the three moderators is driven by genuine differences between positivity-familiarity effects and other misattribution phenomena, the current results pose a challenge to the idea that positivity-familiarity effects result from a common misattribution mechanism that is shared with conceptually similar phenomena. Indeed, the current findings might be parsimoniously explained (i.e., without requiring ad hoc assumptions about low statistical power and ineffective operationalizations) by an alternative account in terms of affective monitoring (Phaf & Rotteveel, 2012). A central aspect of this account is that it assumes an intrinsic link between positivity and familiarity. Feelings of familiarity are assumed to result from fluent processing when initial competition between memory representations (e.g., searching for a matching representation in an old/new judgment task) has been resolved, and this conflict resolution is further accompanied by positive affect (Phaf &

Rotteveel, 2012). As such, positivity might be experienced as familiarity, especially in a context in which familiarity-judgments are required. Assuming that people experience feelings of familiarity when they experience positive affect, conceptual similarities between the actual source of affect (e.g., prime stimulus) and a focal target might be secondary. Monahan et al. (2000) demonstrated that experienced familiarity led to diffuse feelings of positivity. Thus, given the intrinsic relation between familiarity and positivity (Rotteveel & Phaf, 2007), experienced positivity might also lead to diffuse feelings of familiarity. That is, a prime might trigger a general feeling of positivity and with it a general feeling of familiarity, which might explain why conceptual similarity did not moderate positivity-familiarity effects in Experiment 1. If people experience a general feeling of familiarity rather than misattributing primed content (i.e., positivity) to their own response to the target (i.e., familiarity), knowledge about the true source of positivity might not interfere with the occurrence of positivity-familiarity effects. These assumptions also explain why explicit warnings about the effects of prime stimuli on familiarity judgments of the targets did not moderate positivity-familiarity effects in Experiment 3. Finally, although fluent processing only signals familiarity when fluent processing is unexpected (see also Whittlesea & Williams, 1998), it does not necessarily follow from it that positivity needs to be unexpected. The affective monitoring account (Phaf & Rotteveel, 2012) assumes that a quick resolution of conflict is a prerequisite for both feelings of familiarity and positive affect, but it does not assume that experiencing positivity is unexpected. As such, manipulating the salience of positive primes in Experiment 2 might have had little influence on the occurrence of positivity-familiarity effects. Thus, although there are known problems with drawing theoretical conclusions from null effects, the current findings can be parsimoniously explained by affect monitoring, while misattribution accounts require several ad hoc assumptions about statistical power and ineffective operationalizations.

Nevertheless, the failure to find moderating effects in the current research might still be in line with the claim that positivity-familiarity effects result from a common underlying mechanism that is shared with conceptually similar effects to the extent that enabling conditions for the predicted effects were present in previous research but not in the current studies. In Experiment 1, we manipulated conceptual similarity via semantic feature overlap between the primes and targets by varying the similarity of semantic structures between prime (i.e., face) and target (i.e., face or ideograph). Yet, it is possible that similarity between prime and target only reduces source confusion when

individuals perceive primes and targets as dissimilar. Given that we found positivity-familiarity effects irrespective of the similarity manipulation, participants in both conditions might have perceived prime and target as similar enough to confuse the effects of the prime with their reactions to the targets, in line with the misattribution account. Experiment 1 did not explore the effect of a variation of prime types (e.g., face, IAPS picture) in comparison to a variation of targets. Future research should address such variations in a within-participants design to investigate the influence of relative perception of similarity on positivity-familiarity effects.

In Experiment 2, we manipulated the relative frequency of positive and neutral primes, assuming that neutral primes provide a benchmark against which lower frequency positive primes are more surprising. We based the analysis on 40 focal trials with the same positive and neutral primes irrespective of the salience condition to rule out difference between the conditions (e.g., aggregation of positive affect) due to the overall unequal frequency of positive and neutral primes. Yet, whether positivity is indeed perceived as more or less salient likely hinges on participants monitoring the relative frequency of affective signals. Because Experiment 2 did not include an independent indicator of salience, we cannot rule out that, for participants who did not pay attention to the relative frequency of positive and neutral primes, our manipulation of salience was ineffective. To address this limitation, future research could (1) reduce the total number of positive primes in the low frequency condition, (2) keep primes constant on dimensions other than valence (e.g., restrict primes to pictures of faces) to make positive signals stand out (i.e., figure-ground principle), and (3) use negative rather than neutral primes as benchmark to highlight the contrast between context and focal prime (see Phaf & Rotteveel, 2012). However, each of these variations comes with additional disadvantages (e.g., tradeoff between reliability of priming effects and salience manipulation; negative mood induction due to negative primes) that might impact the occurrence of positivity-familiarity effects.

In Experiment 3, we explicitly warned participants about the influence of the primes on judgment of targets. Although such warnings moderated priming effects in prior research (Verwijmeren et al., 2013), we cannot rule out that without additional incentives, at least some of the participants in our study were not motivated to control for an influence of primes on target judgments even when they had the relevant knowledge to do so (see also Hazlett & Berinsky, 2018). Moreover, while we assessed participants' comprehension of the instructions, we did not measure participants' beliefs

in the information they received. If participants did not accept positive primes as a valid source for their feelings of familiarity, they might still show misattribution effects, despite explicit warnings. Consequently, future research should address these possibilities by investigating the role of incentives and beliefs on the effectiveness of warnings in reducing positivity-familiarity effects. That being said, we deem it less likely that low motivation to follow instructions provides an alternative explanation for the lack of moderation in the present study, because we used participants' response behavior as an indicator for motivation to follow instructions and excluded participants who used the same response key on more than 90% of the trials in all three experiments.

Finally, despite the finding of robust positivity-familiarity effects in the present studies, future research should address the role of optimal vs. suboptimal processing conditions (Phaf & Rotteveel, 2005; see also Bornstein, 1989) for the effectiveness of moderators for positivity-familiarity effects. That is, optimal prime processing (i.e., 75 ms, unmasked) might have led to overall weaker positivity-familiarity effects, making the occurrence of potentially even weaker moderation effects less likely. Suboptimal prime processing conditions might foster moderating influences on positivity-familiarity effects (cf. Weil, et al., 2020).

In sum, although we cannot rule out these alternative explanations, the most parsimonious explanation for the current findings (i.e., one that does not require ad hoc assumptions for each individual experiment) is still affective monitoring (Phaf & Rotteveel, 2012). As such, the present findings pose a challenge to the idea that positivity-familiarity effects are functionally equivalent to other misattribution phenomena, such as fluency-familiarity effects. At the very least, they suggest that positivity-familiarity effects are much less affected by known moderators than suggested by prior research and extant theories of misattribution (see also Crandall & Sherman, 2016). Together with prior evidence that known moderators of misattribution do not seem to influence contextual positivity-familiarity effects (Weil et al., 2020), a parsimonious explanation of the current findings is that there is an intrinsic link between positivity and familiarity (see Phaf & Rotteveel, 2012), suggesting that a general feeling of positivity is accompanied by a general feeling of familiarity.

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**Table 1.** Bayes Factors for main effects and interactions on familiarity judgments, Experiment 1.

Main Effects and Interactions	Bayes Factors
Prime Valence	$BF_{10} = 7.161$
Prime-Target Similarity	$BF_{10} = 389.367$
Prime Valence $\times$ Prime-Target Similarity	$BF_{10} = .214$

**Table 2.** Bayes Factors for main effects and interactions on familiarity judgments, Experiment 2.

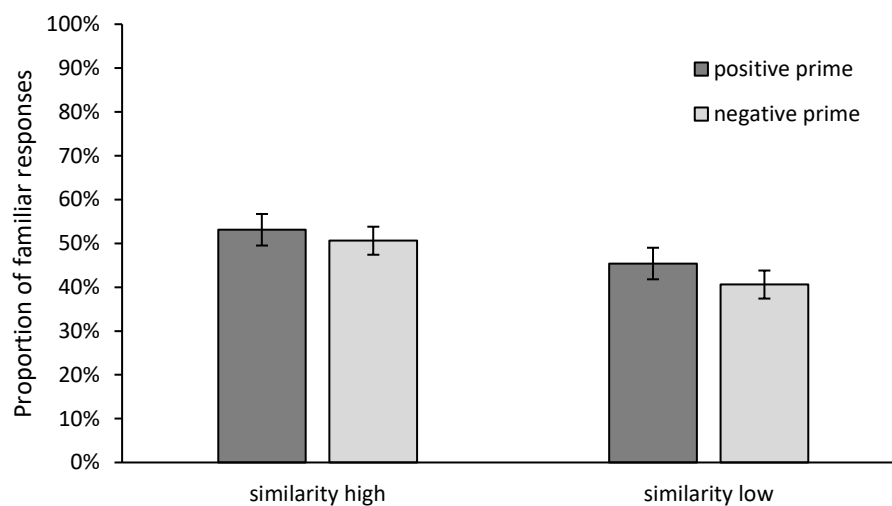
Main Effects and Interactions	Bayes Factors
Prime Valence	$BF_{10} = 2.366$
Prime Valence $\times$ Salience of Positivity	$BF_{10} = .129$

**Table 3.** Bayes Factors for main effects and interactions on familiarity judgments, Experiment 3.

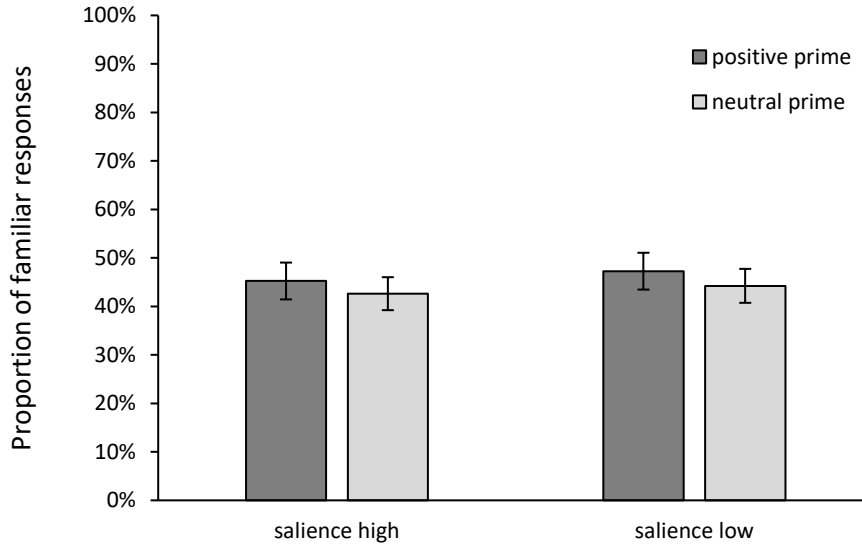
Main Effects and Interactions	Bayes Factors
Prime Valence	$BF_{10} = 163.062$
Prime Valence $\times$ Warning	$BF_{10} = .145$



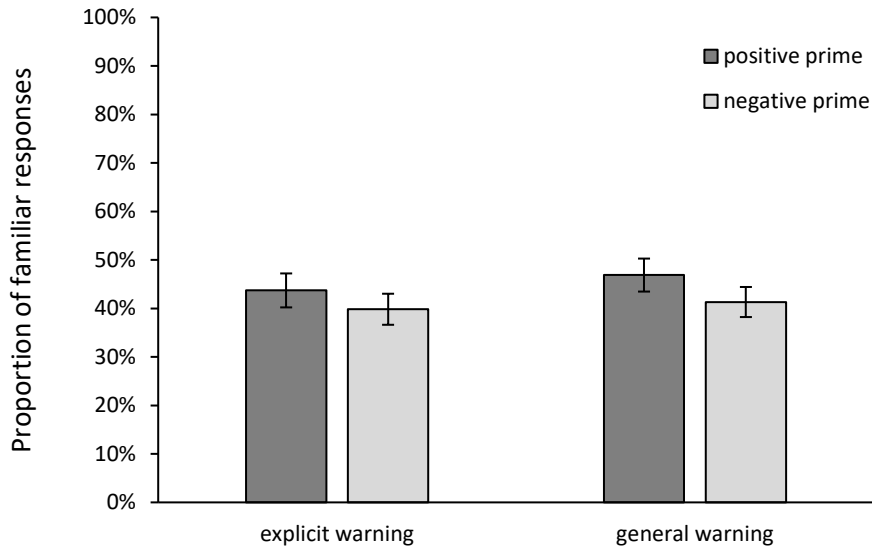
**Figure 1.** Example of target stimulus in the high prime-target similarity condition, Experiment 1. Image taken from Oosterhof and Todorov (2008), edited to achieve blurred, pixelated appearance. Reprinted in line with <https://creativecommons.org/licenses/by-nc-nd/3.0/us/>.



**Figure 2.** Mean percentages of “familiar” judgments as a function of prime valence (positive vs. negative) and prime-target similarity (high vs. low), Experiment 1. Error bars depict 95% confidence intervals.



**Figure 3.** Mean percentages of “familiar” judgments as a function of prime valence (positive vs. neutral) and salience of positivity (high vs. low), Experiment 2. Error bars depict 95% confidence intervals.



**Figure 4.** Mean percentages of “familiar” judgments as a function of prime valence (positive vs. negative) and warning (explicit vs. general), Experiment 3. Error bars depict 95% confidence intervals.