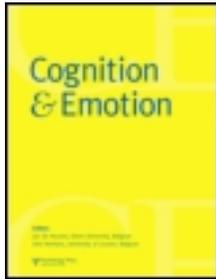


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### Eliminating the mere exposure effect through changes in context between exposure and test

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# Eliminating the mere exposure effect through changes in context between exposure and test

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The present study examined the extent to which increased liking of exposed stimuli—the *mere exposure effect*—is dependent on experiencing the stimuli in the same context in exposure and on test. Participants were repeatedly exposed to pairs of cues (nonsense words) and target stimuli (faces and shapes), and were asked to rate the pleasantness of the target stimuli in a subsequent test phase. Familiar targets were preferred to novel targets—a mere exposure effect was obtained. This preference for familiar targets was disrupted, however, when the cue–target pairings were rearranged between exposure and test, or a novel cue was introduced at test. Overall, the study suggests that the context of exposure and test moderates the mere exposure effect. Liking of stimuli due to exposure is specific to the context of exposure and does not apply to new or familiar but different contexts.

*Keywords:* Mere exposure; Familiarity; Novelty; Fluency; Affect; Context.

Repeated exposure to an initially neutral and novel stimulus increases positive evaluations of that stimulus (Zajonc, 1968). This phenomenon, known as the *mere exposure effect*, has been applied to a wide range of subject matter, including exposure therapy (Dijksterhuis & Smith, 2002), stereotypes and prejudice (Ball & Cantor, 1974), brand preferences (Janiszewski, 1993), food preferences (Pliner, 1982) and aesthetics (Berlyne, 1974; Reber, Schwarz, & Winkielman, 2004; Szpunar, Schellenberg, & Pliner, 2004).

The mere exposure effect is highly robust (see Bornstein, 1989, for a review and meta-analysis). It has been replicated using stimuli from different sensory modalities: auditory (Szpunar et al., 2004), gustatory (Pliner, 1982), olfactory (Balogh &

Porter, 1986), visual (Zajonc, 1968), tactile (Suzuki & Gyoba, 2008), and even cross-modally when the exposure is visual and the evaluation is tactile (Suzuki & Gyoba, 2008). The mere exposure effect has been elicited with various evaluation measures, including liking ratings (Zajonc, 1968), electromyography of facial muscle region activity (Harmon-Jones & Allen, 2001), and voting behaviour (Schaffner, Wandersman, & Stang, 1981). The effect is also relatively permanent. Retention of the preference has been shown to be present over a week following exposure, in fact, the preference sometimes enhances over the retention interval (Seamon, Brody, & Kauff, 1983; Stang, 1975). Finally, the effect is not limited to humans. There is a long history of mere

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exposure in non-human animals; many of these studies precede Zajonc's (1968) influential monograph (see Hill, 1978). Thus, increased liking with exposure seems to be fundamental to animals' cognitive and affective systems, so much so that the phenomenon extends across sensory modalities, behavioural indexes, and time. The goal of the current research is to examine the limits of mere exposure. What are the circumstances under which exposure does *not* lead to greater liking?

Certain variables have been proposed to remove and reverse the mere exposure effect. For example, Berlyne (1974) suggested that liking is an inverted-U shaped function of exposure. Initial exposure increases liking of a stimulus, however extended exposure leads to subsequent decreases in liking. While some studies have found evidence for this inverted U-shape function (e.g., Szpunar et al., 2004), the more dominant pattern of results is that initial exposure and extended exposure increase liking (Bornstein, 1989). Another factor thought to modulate the mere exposure effect is stimulus valence. For example, Dijksterhuis and Smith (2002) found that while exposure increased liking of negative words, it decreased liking of positive words. However, in a similar study, Grush (1976) found the opposite pattern of results. A survey of the literature reveals that the apparent contradiction is common following exposure to valenced stimuli. Thus, few variables have been shown to remove or reverse the mere exposure effect in a reliable fashion (see Topolinski & Strack, 2009, for an exception).

A feature of the majority of mere exposure studies, which might contribute to the overall robustness of the effect, is the similarity in context in which the stimuli are exposed and later tested. In the memory literature, it is well documented that similarity between the exposure and test contexts has a powerful effect on recall: stimuli exposed in one context are better recalled in the same context than a different context. For example, Gruppuso, Lindsay, and Masson (2007) asked participants to make associations between photographs of faces, which took the role of targets, and photographs of scenes, which took the role of contexts during exposure. On test, recollection

sensitivity was better when the photograph of the face was shown in the same context as exposure than when it was shown in a familiar (but different) or new context. Poor memory can be the result of a change to a variety of features of the context. The change can refer to the physical location of exposure and test (e.g., Godden & Baddeley, 1975; Smith, Glenberg, & Bjork, 1978) as well other features that are exposed and tested concurrently with the target stimulus, such as background colour (e.g., Dulsky, 1935; Murnane & Phelps, 1994).

Given that memory and liking are often related—increases in memory are often accompanied by increases in liking (Newell & Shanks, 2007; Szpunar et al., 2004) and memory is often implicated in accounts of the mere exposure effect (Berlyne, 1974; Bornstein & D'Agostino, 1994; Mandler, Nakamura, & Van Zandt, 1987; Whittlesea, 1993)—it seems reasonable to suggest that manipulations of context could have a similar effect on liking as they do on memory. Thus, if changes in context between exposure and test reduce memory, then they might also reduce liking. On the other hand, the robustness of the mere exposure effect might mean that changes in context might have no effect on liking. This would be a rare situation in which the effects of exposure on memory and liking dissociate; memory is sensitive to the exposure context but perhaps liking is not.

In some studies, the mere exposure effect has been robust against changes in context between exposure and test. Rather than manipulate the context via features of the environment, these studies manipulate components of the stimuli themselves following exposure to those stimuli. For example, Zizak and Reber (2004); see also Gordon & Holyoak, 1983) asked participants to memorise a series of consonant strings (stimuli) generated by a finite-state grammar, which specifies permissible combinations of the letters (components) in the strings. In a test phase, participants were presented with exposed strings, novel strings generated from the grammar, and novel strings that were not permissible within the grammar. Participants preferred both exposed

strings and novel grammatical strings to novel non-grammatical strings. The effect is known as the *structural mere exposure effect*, because the preference acquired through exposure generalises to stimuli with a similar structure. Generalisation to a similar structure is a type of resistance to context change because familiar components can be rearranged with other familiar components (in the novel grammatical strings). The structural mere exposure effect demonstrates that exposed stimuli can be altered quite profoundly, but as long as they contain familiar components, participants will still prefer those stimuli to novel stimuli. Thus, the literature suggests that the mere exposure effect is almost ubiquitous—familiarity with the test stimulus itself (Bornstein, 1989; Zajonc, 1968), the structure of the stimulus (Gordon & Holyoak, 1983; Newell & Bright, 2001; Zizak & Reber, 2004) or at least components of the structure (see Dulany, Carlson, & Dewey, 1984) enhances liking of the stimulus.

In contrast to the literature on the mere exposure effect, work directly focusing on the effects of processing fluency (the notion that more easily processed stimuli are preferred and feel familiar) on memory suggests that it is not only the absolute familiarity of the components of stimuli that determine their pleasantness, but that the manner in which the components go together is also important. Whittlesea (1993, Experiment 5) manipulated the relationship between components, which in this case were words, via the semantic context in which the words were presented. Semantic contexts were presented prior to the target word stimuli such that they were in a familiar relationship (“The bored student opened her mouth to . . . yawn”) or a meaningful but less familiar relationship (“The evening gown was missing a . . . bead”). Half of the target words in each context had been exposed alone in an earlier exposure phase. The target words that had been exposed were rated more pleasant than those that had not been exposed, replicating the mere exposure effect. Furthermore, the target words that were presented on test in a familiar relationship with the semantic context were rated more pleasant than those presented in a less familiar

relationship. The effects of exposure and the familiarity of the relationship between the semantic context and the target word were additive; the pleasantness ratings for target words that were exposed in the study list and that were presented in a familiar relationship with the context on test, were greater than the ratings given for either factor alone. This experiment suggests that, under some circumstances, the context in which a familiar target is presented is an important determinant of the pleasantness of that target.

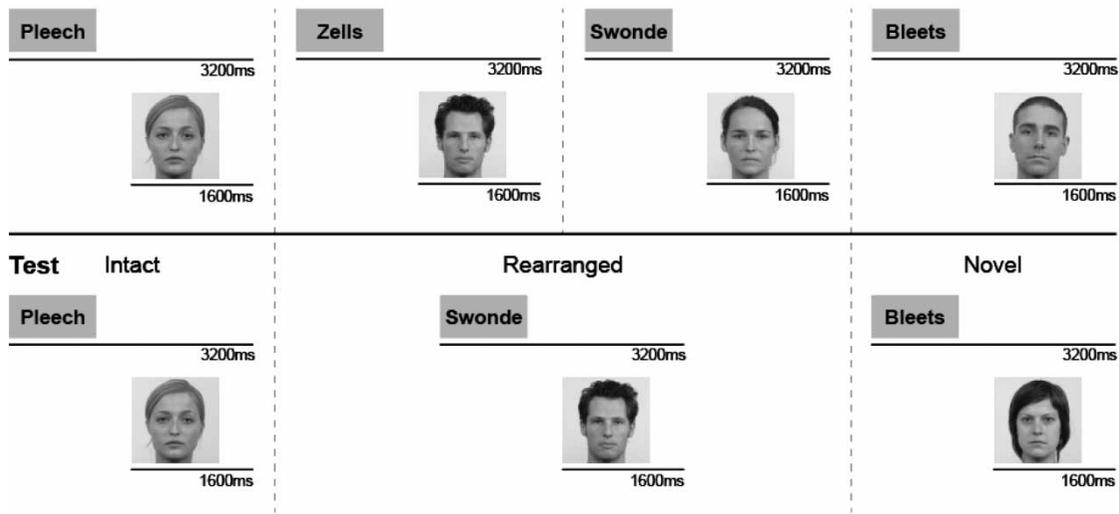
The present study extended this line of research with the aim of discovering whether disruptions of the relationship between a stimulus and the context in which it is presented might reduce the strength of the mere exposure effect. In the current experiments the relationship between a target stimulus and its context was learned through exposure. This allowed us to control the frequency of exposure to the components of a stimulus and the context in which the stimulus is presented independently of each other. Our novel procedure (described below) permits characterisation of the roles played by the familiarity of target stimulus and the context in which the target stimulus is exposed in the establishment of a mere exposure effect.

## EXPERIMENT 1

Before describing the method we first clarify some terms. Exposure always consisted of presentation of two experimenter-defined components, which were presented as a pair. One of those components was a cue (which was a nonsense word) and the other a target stimulus (which in Experiments 1–3 was a photograph of a face and in Experiment 4 was a complex shape). The cue (nonsense word) plays a similar role to that of contexts in the reviewed literature above.

Experiment 1 consisted of an exposure phase, during which participants were encouraged to learn an association between the nonsense word and the face (see Figure 1 for an example), and a subsequent test phase. There were eight exposure trials for each word–face pair, and the words and

## Exposure



**Figure 1.** An example of the word–face pairs used as stimuli on exposure and on test. The first row represents a sequence of pairs of nonsense words and faces used in the exposure phase. The second row shows these pairs manipulated into intact, rearranged and novel conditions. In the intact condition, the nonsense word and face pair was identical to the exposure pair. In the rearranged condition, an exposed word (from the third exposure column) was combined with an exposed face (from the second exposure column) to form a new test pair. In the novel condition, an exposed word (from the fourth exposure column) was paired with a novel face.

faces that comprised the pairs were consistent across each of the eight trials. The eight trials were intermixed with other word–face pair trials. The procedure of the exposure phase was the same for all experiments. Participants were told to learn which face followed each word.

During the test phase of Experiment 1, as shown in Table 1, participants rated the pleasantness of target faces that were either preceded by the same familiar nonsense word cue that they were paired with in the exposure phase (referred to as intact), or preceded by a familiar nonsense

word cue that had been exposed in a different pair during the exposure phase (referred to as rearranged). Participants also rated novel faces that were preceded by a familiar nonsense word that had been exposed in a different pair during the exposure phase (referred to as novel).

The experiment was designed to test whether changes to the components of a stimulus (i.e., the cue and the target) between exposure and test affects its pleasantness. Specifically, we tested whether or not the mere exposure effect generalises to familiar target faces presented with

**Table 1.** Design of test cue–target pairs in Experiments 1 to 4

		Test Pairs		
<i>Experiments 1, 4a, 4b</i>				
Target	Familiar (Intact)	Familiar (Rearranged)	Novel	
Cue	Familiar	Familiar	Familiar	
<i>Experiment 2</i>				
Target	Familiar (Intact)	Familiar	Novel	Novel
Cue	Familiar	Novel	Familiar	Novel
<i>Experiment 3</i>				
Target	Familiar (Intact)	Familiar	Novel	Novel
Cue	Familiar	—	Familiar	—

a familiar but different test cue. Consistent with Whittlesea's (1993) observed increase in pleasantness for terminating target words that were predicted by a semantic cue, it was expected that target faces would be rated as higher in pleasantness when presented with the same cue word as exposure (intact) than when the target face was presented with a familiar but different cue word (rearranged).

## Method

*Participants.* Twenty-five undergraduate students (4 male, 21 female;  $M_{\text{age}} = 20$  years) from the University of New South Wales volunteered for the experiment in return for course credit.

*Apparatus and stimuli.* The target stimuli were 36 greyscale photographs of Caucasian faces with a neutral facial expression obtained from the Radboud Faces Database (Langner et al., 2010) and 36 five-to-six-letter nonsense words generated from The ARC Nonword Database (Rastle, Harrington, & Colheart, 2002). The photographs were 6.7 cm by 10.2 cm in size and were presented centrally on a 17-inch LCD computer monitor (1280 × 1024 resolution; 60-Hz refresh rate). The nonsense words were presented above the location of the faces on a mid-grey rectangle, which measured 6.7 cm by 2.2 cm. Stimulus presentation was controlled using the Revolution Studio 3.0 program.

*Design and procedure.* The experiment consisted of an exposure phase and then a test phase. In the exposure phase, 24 nonsense words were paired, one at a time, with 24 faces. The word appeared alone for 1,600 ms, after which the face appeared on screen with the nonsense word for a further 1,600 ms. Thus, each trial lasted 3,200 ms. The word and the face were removed simultaneously at the end of the trial. There was a 500 ms interval between word–face pairs. Each word–face pair was presented eight times across eight blocks (once each block). The word–face pairs in each block were presented in randomised order. To encourage participants to pair the nonsense word

with the face and to encourage participants to pay attention, they were told that the nonsense words were the surnames of the people in the photographs.

The test phase followed immediately after the exposure phase. In the test phase, 12 of the 24 faces that were shown in the exposure phase were each presented with the same word that was paired with the face in the exposure phase (intact). Another 12 faces from the exposure phase were each presented with a familiar nonsense word that was not paired with the face in the exposure phase. These test pairs were made by rearranging the nonsense words and faces of familiar word–image pairs (rearranged). A novel set of 12 faces (not shown in the exposure phase) were presented with the remaining 12 nonsense words that were shown in the exposure phase. These novel faces with a familiar nonsense word were used as a novel control.

The timing of the stimulus presentations on test was such that the nonsense word was presented alone for 1,600 ms and then the face appeared with the nonsense word still present. After a further 800 ms participants rated the pleasantness of the faces from 1 (*Highly unpleasant*) to 100 (*Highly pleasant*). Participants had unlimited time to rate the faces. Participants were asked to rate the pleasantness of the face (rather than the nonsense word or the nonsense word–face pair).

The pairing of nonsense words and faces and their allocation to intact, rearranged and novel control pairs was randomised for each participant at the beginning of the experiment.

## Results and discussion

A set of planned contrasts using a multivariate, repeated-measures model (O'Brien & Kaiser, 1985) was used to analyse the data. A significance value of  $p < .05$  was set for all statistical analyses.

The mean rating for faces in each of intact, rearranged and novel control pairs is shown in Figure 2. The mean rating of familiar faces presented in intact word–face pairs was greater than novel control faces,  $F(1, 24) = 6.75$ ,  $MSE = 360.18$ ,

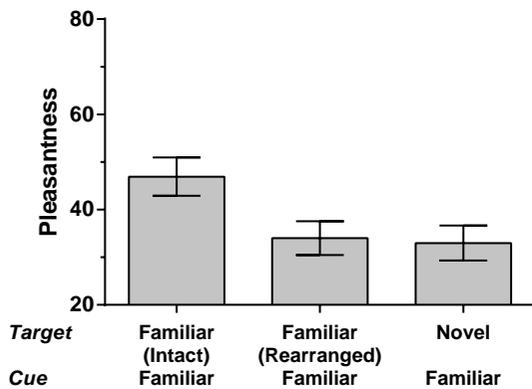


Figure 2. Mean pleasantness ratings in Experiment 1. *Familiar(Intact)* refers to familiar faces that were presented in word–face pairs on test that were identical to word–face pairs during exposure. *Familiar(Rearranged)* refers to familiar faces that were presented with familiar but different words on test. *Novel* refers to novel faces that were presented with a familiar word. Error bars indicate standard error of the means.

$p = .02$ ,  $d = 0.75$ . However, ratings of familiar faces presented in rearranged word–face pairs were no greater than the novel control faces,  $F(1, 24) = 0.39$ ,  $MSE = 33.82$ ,  $p = .54$ ,  $d = 0.18$ . Furthermore, for familiar faces, the mean rating was greater when they were presented in an intact word–face pair than a rearranged word–face pair,  $F(1, 24) = 6.10$ ,  $MSE = 342.45$ ,  $p = .02$ ,  $d = 0.71$ .<sup>1</sup>

The results show that violating the relationship between an experimentally trained nonsense word (the cue) and a familiar face (the target) has a negative consequence for the pleasantness of the face. Ordinarily, familiar stimuli are preferred to novel stimuli—the mere exposure effect. This effect was replicated here in the intact condition, where the same nonsense word cue preceded the target face in study and at test. However, presenting a familiar but different cue before the target stimulus on test disrupted the mere exposure effect, as seen in our rearranged condition.

Experiment 1 specifically manipulated the relationship between cues and targets. The frequency of exposure to the cue for each of the intact, rearranged and novel control pairs was equated. However, the familiarity of the cue might have an additional effect on the pleasantness of the target. Furthermore, another finding from the memory literature demonstrates that, as well as familiar but different contexts (Gruppuso et al., 2007), novel contexts also have deleterious effects on recall (Dulsky, 1935) and recognition (Gruppuso et al., 2007; Murnane & Phelps, 1994). Experiment 2 systematically manipulated the familiarity of the cue and familiarity of the target to test whether a novel context disrupts the mere exposure effect.

## EXPERIMENT 2

As in Experiment 1, participants were exposed to nonsense word cues paired with target faces. They then rated the pleasantness of the exposed target faces and novel faces presented with familiar cue words. In addition, participants in Experiment 2 rated familiar faces from the exposure phase and novel faces paired with a novel word cue (see Table 1). Thus, there were two within-subject factors in the present experiment; familiarity (novelty) of the target face and familiarity (novelty) of the cue word. Given that novel contexts have a deleterious effect on memory, and Experiment 1 shows that the effect of context on liking is similar to previous effects of context on memory, it was expected that a novel context would disrupt the mere exposure effect.

## Method

Twenty-eight undergraduate students (6 male, 22 female;  $M_{\text{age}} = 19$  years) from the University of New South Wales volunteered for the experiment

<sup>1</sup>An analysis of the first half of test trials versus the second half of test trials was conducted across all experiments. In Experiment 1, across all test trial types, higher ratings were given for the first half of test trials compared to the second half of test trials,  $F(1, 24) = 7.75$ ,  $MSE = 75.27$ ,  $p = .01$ ,  $d = 0.80$ , however this effect was not reliable for Experiments 2–5, highest  $F(1, 29) = 3.33$ ,  $MSE = 107.17$ ,  $p = .08$ ,  $d = 0.16$ . More importantly, the test trial order did not interact (first or second order) with any of the experimental factors for Experiments 1–5, highest  $F(1, 23) = 3.57$ ,  $MSE = 73.51$ ,  $p = .07$ ,  $d = 0.56$ .

in return for course credit. Participants who completed Experiment 1 were excluded from Experiment 2. The method of Experiment 2 was the same as Experiment 1 in all respects except for the following. From the pool of 36 nonsense words and photographs, 24 were randomly selected at the beginning of the experiment. The word–face pairs were randomly assigned to one of the four test conditions, with six pairs in each. These were the intact and novel control conditions from Experiment 1, as well as the familiar face with novel word and novel face with novel word conditions. Thus, on test the words were either familiar or novel, as were the faces (see Table 1).

## Results and discussion

The mean rating of familiar and novel faces preceded by a familiar or novel nonsense word are shown in Figure 3. The data were analysed using a 2 (Cue: familiar vs. novel)  $\times$  2 (Target: familiar vs. novel) repeated-measures analysis of variance (ANOVA). The ANOVA showed that, averaged across test trials in which the nonsense words were familiar and novel, familiar faces were rated more pleasant than novel faces,  $F(1, 27) = 4.54$ ,  $MSE = 257.98$ ,  $p = .04$ ,  $d = 0.58$ . Familiarity of the nonsense word also had an effect on pleasantness ratings; averaged across test trials in

which the faces were familiar and novel, the faces were rated more pleasant when they were preceded by a familiar nonsense word than a novel nonsense word,  $F(1, 27) = 4.83$ ,  $MSE = 146.16$ ,  $p = .04$ ,  $d = 0.60$ . Most importantly, the interaction between the familiarity of the face and the familiarity of the nonsense word was significant,  $F(1, 27) = 5.96$ ,  $MSE = 328.06$ ,  $p = .02$ ,  $d = 0.66$ . Simple effects analyses revealed that familiar faces preceded by a familiar and matching nonsense word (intact) were rated more pleasant than familiar faces preceded by a novel nonsense word,  $F(1, 27) = 7.07$ ,  $MSE = 354.24$ ,  $p = .01$ ,  $d = 0.72$ . Whether there was a familiar or novel nonsense word before a novel face made no significant difference to ratings of the novel face,  $F(1, 27) = 1.30$ ,  $MSE = 119.98$ ,  $p = .26$ ,  $d = 0.31$ .

The result shows that a familiar face preceded by a novel word disrupts the mere exposure effect for the face. Thus, the mere exposure effect seems to be context specific because it is disrupted by an explicit change in context, be that to a familiar but different context or a novel context. Both the familiar but different context (Experiment 1) and the novel context (Experiment 2) represent a change between exposure and test, whereas the intact cue and target were unchanged between exposure and test. It may be that, at least in this particular experimental design, the mere exposure

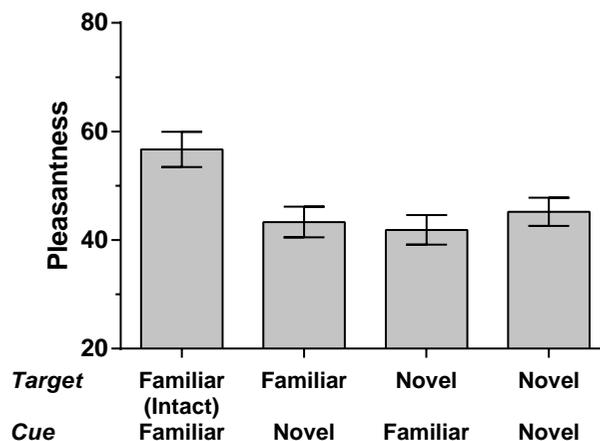


Figure 3. Mean pleasantness ratings and standard error of the means in Experiment 2. Target stimuli (faces) were either familiar or novel and presented with a familiar cue (nonsense word) or a novel cue.

effect is highly sensitive to *any* kind of change between exposure and test. Thus, Experiment 3 tests if a more minor change between exposure and test—simply omitting the cue before the target stimulus on test—is sufficient to disrupt the mere exposure effect.

### EXPERIMENT 3

Experiment 3 was identical to Experiment 2 except that instead of there being novel words in the test phase the cue words were simply omitted (see Table 1). Thus, there were two within-subject factors; familiarity (novelty) of the target face and the presence (absence) of the cue word.

#### Method

Twenty-four participants (8 male, 16 female;  $M_{\text{age}} = 19$  years) from the University of New South Wales who volunteered for the experiment in return for course credit. Those who completed Experiments 1 or 2 were excluded from participating in Experiment 3. The method was the same as Experiment 2 with the exception that, on test, novel nonsense words were omitted. Because there was no word to precede the image for the familiar image alone and novel image alone test trials, the grey rectangle on which the words were normally displayed was blank.

#### Results and discussion

The mean rating of familiar and novel images preceded by a familiar word or no word are shown in Figure 4. The data were analysed using a 2 (Cue: present vs. omitted)  $\times$  2 (Target: familiar vs. novel) repeated-measures ANOVA. Averaged across test trials with and without nonsense words, familiar images were rated more pleasant than novel images,  $F(1, 23) = 7.91$ ,  $MSE = 345.60$ ,  $p = .01$ ,  $d = 0.83$ . In contrast, presenting the image alone or with a word made no difference to pleasantness ratings,  $F(1, 23) = 0.81$ ,  $MSE = 14.12$ ,  $p = .38$ ,  $d = 0.27$ . Furthermore, the interaction between the familiarity of the image and

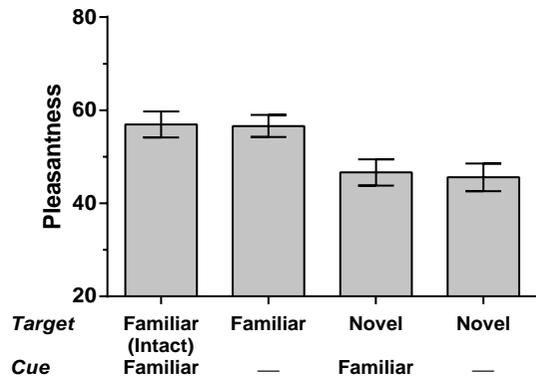


Figure 4. Mean pleasantness ratings and standard error of the means in Experiment 3. Target stimuli (faces) were either familiar or novel and presented with a familiar cue (nonsense word) or no cue.

the presence of the word was not significant,  $F(1, 23) = 0.16$ ,  $MSE = 19.90$ ,  $p = .69$ ,  $d = 0.12$ .

The results replicate those of Experiments 1 and 2 by showing that the mere exposure effect can be observed following an exposure phase in which target stimuli are paired with cues. Experiment 3 additionally shows that our observation of the mere exposure effect is not dependent on the pairs from the exposure phase being present on test. Single items can be presented and, although they were exposed in conjunction with other items earlier in the experiment, the familiar items were preferred to novel ones on test. Thus, omitting the cue before the target stimulus is not sufficient to disrupt the mere exposure effect.

It can be concluded that, in the current procedure, the mere exposure effect is not sensitive to simply any kind of change in the nature of the cue between exposure and test. Thus, presenting an item in a familiar but different context (Experiment 1) or in a novel context (Experiment 2) appears to produce a special kind of change between exposure and test that somehow disrupts the mere exposure effect.

### EXPERIMENT 4A

In the exposure phase of the experiments so far, participants were explicitly instructed to learn the

relationship between the nonsense words and their following faces. Thus, their attention was likely to be deliberately directed towards the relationship between the cue word and the target face during the exposure phase. The instruction may have had an influence on their interpretation of the pleasantness test; specifically, participants may have interpreted the pleasantness test as a memory test because the exposure phase instruction made memory performance salient. Thus, participants would be motivated to give pleasantness ratings in accordance with the strength of their memory for the word–face relationships that they had learned in the exposure phase. Furthermore, they might be quite successful at this task because memory for faces (and perhaps name–face pairs) is an area of human expertise relative to other stimulus categories (Diamond & Carey, 1986).

Experiments 4a and 4b addressed the idea that participants might interpret the pleasantness task as a memory test. Experiment 4b directly tests this idea by implementing an instructional change. First, however, we tested the generality of the findings from Experiment 1 by using the same procedure, but with more easily confusable target stimuli—complex shapes. We hypothesised that, if participants interpreted the pleasantness task as a memory task, more confusable stimuli should make their ratings less reliable because discrimination between stimuli on the basis of recognition would be more difficult.

## Method

The participants were 24 undergraduate students (10 male, 14 female;  $M_{\text{age}} = 19$  years) from the University of New South Wales, who volunteered for the experiment in return for course credit. Participants who completed any of Experiments 1–3 were excluded from Experiment 4a.

The target stimuli were 36 complex shapes created by intersecting several geometric shapes. The shapes were coloured black and presented on a 6.7 cm by 6.7 cm mid-grey background. The nonsense words were presented above the location of the shapes on a mid-grey rectangle, which

measured 6.7 cm by 2.2 cm. Participants were asked to try to learn which shape follows each name, then on test to rate the pleasantness of the target stimuli. All other aspects of the design and procedure were identical to Experiment 1.

## Results and discussion

The mean rating for shapes in each of intact, rearranged and novel control pairs is shown in Figure 5. The mean rating of familiar shapes presented in intact word–shape pairs was greater than novel control shapes,  $F(1, 23) = 17.65$ ,  $MSE = 670.01$ ,  $p < .01$ ,  $d = 1.24$ , as were familiar shapes presented in rearranged word–shape pairs,  $F(1, 23) = 7.66$ ,  $MSE = 56.51$ ,  $p = .01$ ,  $d = 0.82$ . Importantly, for familiar shapes, the mean rating was greater when they were presented in an intact word–shape pair than a rearranged word–shape pair,  $F(1, 23) = 13.06$ ,  $MSE = 592.16$ ,  $p < .01$ ,  $d = 1.07$ .

The results partially replicate those of Experiment 1 with shape stimuli. However, in contrast to the complete loss of the mere exposure effect seen with faces in Experiment 1, presenting a familiar but mismatching nonsense word before the shape renders the shape slightly more pleasant than a novel shape. The result seems to reflect larger effect sizes for Experiment 4a in general. Perhaps for stimulus classes, such as faces, that are frequently evaluated with respect to their pleasantness, the influence of variables extrinsic to the

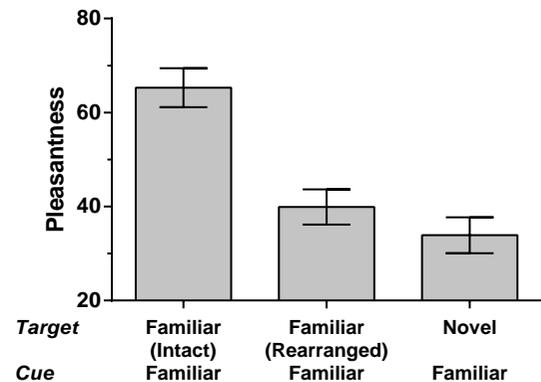


Figure 5. Mean pleasantness ratings and standard error of the means for shapes in Experiment 4a.

stimulus, such as exposure and context, have a relatively small effect or participants are unwilling to use the full range of the rating scale. Nevertheless, the main finding of Experiment 1 and Experiment 4a is consistent; a familiar stimulus is more pleasant when presented in the same context in which it was previously experienced than when presented in an equally familiar but different context.

## EXPERIMENT 4B

Experiment 4b used a change to the instructions for both the exposure and test phases to de-emphasise memory performance to the participant. At the beginning of the exposure phase, participants were told that they would see a nonsense word followed by a shape. They were asked only to observe the two stimuli and press a spacebar to begin the next trial. Thus, unlike in Experiment 4a, participants were not explicitly instructed to learn the word–shape pairs. Furthermore, at the beginning of the test phase, participants were given an instruction that was intended to remove their motivation to deliberately use memory to guide pleasantness ratings. Participants were (falsely) informed that none of the test shapes had been exposed in the previous study phase of the experiment, although some shapes might look similar to those previously exposed. We continued to use the complex shapes in this experiment because we thought that they might be more susceptible to this misinformation than more distinctive stimuli such as faces.

The two changes to the instructions attempted to make memory performance far less salient to the participants, so that the motivation for deliberately using memory as an index of pleasantness was minimised.

### Method

Twenty-four participants (12 male, 12 female;  $M_{\text{age}} = 19$  years) from the University of New South Wales volunteered for the experiment in return for course credit. Participants who completed any of Experiments 1–4a were excluded

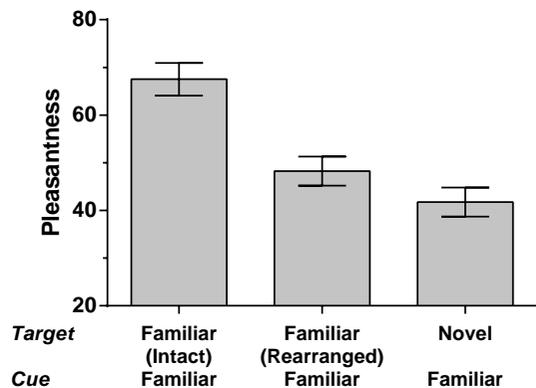


Figure 6. Mean pleasantness ratings and standard error of the means for shapes in Experiment 4b according to their test pair.

from the experiment. All other aspects of the method were identical to that of Experiment 4a, except for the changed instructions described above.

### Results and discussion

The mean rating for shapes in each of intact, rearranged and novel control pairs is shown in Figure 6. The results are very similar to those of Experiment 4a. Familiar shapes presented in intact word–shape pairs were rated more pleasant than novel control shapes,  $F(1, 23) = 19.45$ ,  $MSE = 409.40$ ,  $p < .01$ ,  $d = 1.30$ , as were familiar shapes presented in rearranged word–shape pairs,  $F(1, 23) = 4.57$ ,  $MSE = 110.59$ ,  $p = .04$ ,  $d = 0.63$ . Again, for familiar shapes, those that were presented in an intact word–shape pair were rated more pleasant than those that were presented in a rearranged word–shape pair,  $F(1, 23) = 14.09$ ,  $MSE = 316.25$ ,  $p < .01$ ,  $d = 1.11$ .

Experiment 4b replicates Experiment 4a in a situation in which it is less likely that participants deliberately used their memory performance to drive their pleasantness ratings.

## GENERAL DISCUSSION

The present experiments show that the mere exposure effect is sensitive to the context in which the targets of evaluations are presented.

Specifically, when targets (faces or shapes) are repeatedly exposed with a particular cue (word) and, on test, the target is shown with a different cue, the mere exposure effect is disrupted. The disruption occurs when the word is familiar and has been repeatedly exposed with a different face (Experiment 1) or shape (Experiment 4) and when the word is novel (Experiment 2). A typical mere exposure effect occurs, however, when the word is omitted from the test and the face is presented alone (Experiment 3). Thus, the increase in pleasantness of a target normally brought about through prior exposure (the mere exposure effect) is disrupted if, on test, the target stimulus is preceded by a cue that is different from the cue that preceded it during exposure. Thus, when novel components (cues and targets) or novel relationships between components are sufficiently salient the mere exposure effect is severely reduced or even lost.<sup>2</sup>

A survey of the literature shows that the present results represent one of the very few demonstrations of limiting conditions on the mere exposure effect. The mere exposure effect is, generally, very robust (Bornstein, 1989). However, our consistent finding is that certain arrangements result in familiar target stimuli being rated almost as negatively as novel target stimuli. Because the arrangements introduced novel components or novel relationships between components on test, the finding cannot be explained by boredom due to high levels of familiarisation. Recent evidence suggests that certain cues can increase the attractiveness of novel stimuli. While familiar stimuli are preferred when people are given, in a secondary task, prevention-focused instructions (e.g., errors linked to decreased reward), novel stimuli are preferred when people are given progression-focused instructions (e.g., good performance linked to increased reward;

Gillebaart, Forster, & Rotteveel, 2012). Similarly, regression cues (e.g., counter-clockwise movements) maintain peoples' preference for familiar stimuli and progression cues (e.g., clockwise movements) lead to a preference for novel stimuli (Topolinski & Sparenberg, 2012). However this evidence too does not seem to explain the finding of our study because we used only meaningless cues.

One potential explanation assumes that the target stimuli did not reach the asymptote of the familiarity–pleasantness function before test. If this was the case, addition of any kind of novelty would make the target stimuli less pleasant. For this account to accommodate the present results it would be necessary for a source of novelty external to the familiar target stimulus (including novel relationships between familiar stimuli) to affect the target's pleasantness. Any unpleasantness generated by that novelty would then have to be misattributed to the target stimulus. Such misattributions seem to be prevalent in the mere exposure literature (Bornstein & D'Agostino, 1994; Mandler et al., 1987; Whittlesea, 1993) and thus such a mechanism may indeed account for the current results.

As we noted in Experiment 4, associations between memory and pleasantness (Newell & Shanks, 2007; Szpunar et al., 2004) can present a challenge when interpreting the pleasantness measure. Participants might deliberately use their recognition of stimuli or stimulus pairs to guide their pleasantness ratings. Thus, the pleasantness ratings might not measure pleasantness but memory. Previous studies have attempted to address this challenge by using between-subject designs and therefore reducing demand characteristics (Monahan, Murphy, & Zajonc, 2000), by using indirect measures of pleasantness (Harmon-Jones & Allen, 2001), and behavioural measures of

<sup>2</sup>We attempted to make the relationships between components more and less salient by manipulating the timing of the target stimulus with respect to the cue. Following Whittlesea and Williams (2001), we hypothesised that a delay between the presentation of cue and the target would allow participants to generate an expectation of the target, thus rendering the target salient. However simultaneous presentation of the cue and target would not allow the participants to generate an expectation of the target upon viewing the cue (because the target would already be visible). No support for this hypothesis was found; the timing of the target stimulus had no reliable effect on pleasantness.

pleasantness with non-human animals (see Hill, 1978). Experiment 4b used an instruction intended to lead participants to falsely believe that all of the test stimuli and were equally novel. Thus, according to the experimenter, recognition was an irrelevant cue to discriminate between pleasant and unpleasant stimuli. With the instruction, we replicated the mere exposure effect when the target stimulus was presented in an intact pair, and a disruption of the mere exposure effect when the target stimulus was presented in a rearranged pair. Hence, in the present study we contend that any motivation for participants to use recognition as a basis for pleasantness did not originate from the experiment instructions. Interestingly, Bornstein and D'Agostino (1994) showed that a very similar instruction, which informed participants that all of the test stimuli were new (and therefore that recognition would not be useful), increased the size of the mere exposure effect.

The present experiments, with the exception of Experiment 4b, manipulated contextual components (nonsense word cues) in a way that is integral to the encoding task (by associating those nonsense words with target stimuli). However, the term context has been used to describe a variety of manipulations. Context effects on memory have been observed when the components that change are global and incidental to the encoding task (e.g., Dulsky, 1935; Godden & Baddeley, 1975; Smith et al., 1978) and when they are local and non-incidental to the encoding task (e.g., Gruppuso et al., 2007; Murnane & Phelps, 1994; Tulving & Thomson, 1973; Whittlesea, 1993). To test the generality of our findings, future research could build on Experiment 4b and examine whether global and incidental contextual manipulations, such as the background colour and location of stimuli on the background, also affect the mere exposure effect.

A slightly different pattern of results has been observed in the structural mere exposure effect. In that case, stimulus changes between exposure and test do not disrupt the mere exposure effect; novel grammatical strings are rated as no less pleasant than familiar grammatical strings (Zizak & Reber,

2004). However, examination of the procedure of a structural mere exposure experiments suggests that the difference in novelty between the novel and familiar grammatical strings is less than the difference between our intact and rearranged stimulus pairs. In the structural mere exposure effect, the operational definition of a non-grammatical string is one that has non-exposed bigrams (letter pairs). Thus, every bigram present in the novel grammatical strings on test must also have been presented in exposure. These novel grammatical test items are made novel with non-exposed trigrams—letter triplets. Thus, the test grammatical strings in the structural mere exposure effect are novel in a much more subtle way than are our rearranged test pairs; when the relationship between components is violated in the current study, it is very obvious.

Overall, a wealth of past research has shown that familiar stimuli are preferred to novel stimuli. The present study contributes to this conclusion and adds that the size of this effect is reliably moderated by the similarity of one's previous and current experience with the stimulus. Familiar target stimuli are much more pleasant when preceded by the same cue with which the target stimulus was previously exposed. A change in the cue that precedes a familiar target stimulus reduces the pleasantness that is normally associated with familiarity.

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