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Multiple context mere exposure: Examining the limits of liking

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Recent evidence suggests that increased liking of exposed stimuli—a phenomenon known as the mere exposure effect—is dependent on experiencing the stimuli in the same context at exposure and test. Three experiments extended this work by examining the effect of presenting target stimuli in single and multiple exposure contexts. Target face stimuli were repeatedly paired with nonsense words, which took the role of contexts, across exposure. On test, the mere exposure effect was found only when the target face stimuli were presented with nonsense word cues (contexts) with which they had been repeatedly paired. The mere exposure effect was eliminated when exposure to target face stimuli with the nonsense word cues (contexts) was minimal, despite the overall number of exposures to the target face being equated across single- and multiple-context exposure conditions. The results suggest that familiarity of the relationship between stimuli and their context, not simply familiarity of the stimuli themselves, leads to liking. The finding supports a broader framework, which suggests that liking is partly a function of the consistency between past and present experiences with a target stimulus.

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

A substantial literature shows that repeated exposure to a stimulus enhances positive evaluations of that stimulus—the *mere exposure effect* (Bornstein, 1989; de Zilva, Vu, Newell, & Pearson, 2013; Zajonc, 1968) (see Figure 1a). The phenomenon has broad implications: exposure can be used to treat phobias (Siegel & Weingerger, 2012), to create brand preferences (Stafford & Grimes, 2012), and to drive aesthetic appreciation (Reber, Schwarz, & Winkielman, 2004).

Recent evidence shows that the benefit of exposure on liking is specific to the context of exposure and does not generalize to other familiar or new contexts. Specifically, de Zilva, Mitchell, and Newell (2013; see Figure 1b) exposed target face stimuli each with a single unique nonsense word cue, which served as the context.[1] The mere

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[1]The term "context" has been used broadly in the memory literature. Context can refer to the environment in which the experiment is located, such as the exposure and test rooms (Smith, Glenberg, & Bjork, 1978), specific properties of the environment, such as the colour of the background and the position of target stimuli within it (Murane & Phelps, 1994), and other stimuli that precede or co-occur with the target stimulus such as images (Gruppuso, Lindsay, & Masson, 2007) or words (Tulving & Thomson, 1973), which is the category that describes our use of the term "context". We note that the learning literature may exclude from its definition of context some of these categories by including only low salience, background stimuli that have a long duration.

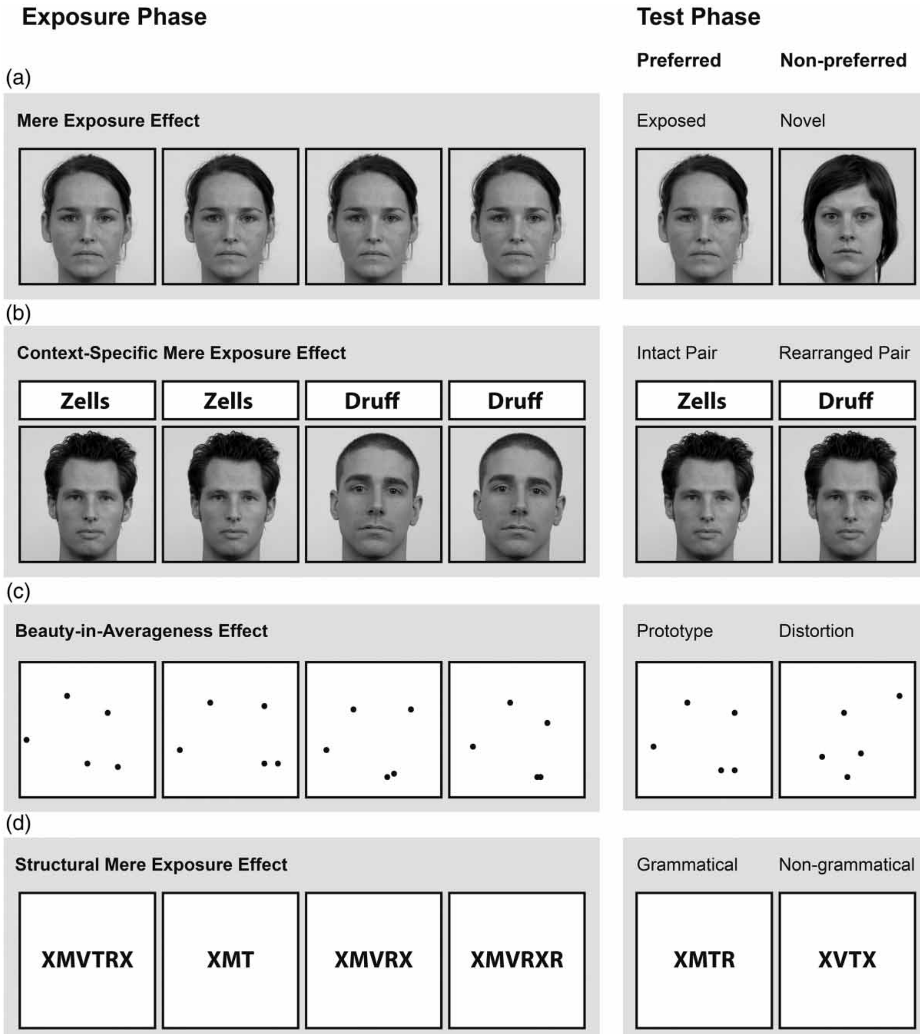

Figure 1. *Each row shows a different exposure effect from the literature. An example of the exposure phase is shown on the left and the test phase on the right. For these effects, the preferred stimulus is the one that is most similar to the exposed stimulus or set of stimuli. The basis of the similarity can be because the test stimulus is perceptually identical to the exposed stimulus (a; mere exposure effect), because the exposed stimulus and the test stimulus are accompanied by the same external cue (b; context-specific mere exposure effect), because the test stimulus is a prototype of the exposed set of stimuli (c; beauty-in-averageness effect), or because the exposed set of stimuli and the test stimulus follow a common underlying structure (d; structural mere exposure effect).*

exposure effect was found when the target face stimuli were presented with the same nonsense word cue (context) as in exposure, but not when they were presented with a familiar but different nonsense word cue (context).

Variants of the mere exposure effect, the *beauty-in-averageness effect* and the *structural mere exposure effect*, show that the mere exposure effect can be robust to certain changes between exposure and test. In the beauty-in-averageness effect (see Figure 1c), participants are exposed to dot patterns that are distortions of a prototype dot pattern (however, they are never exposed to the version of the dot pattern that is the prototype). Following exposure, prototypes of exposed dot patterns are rated as more attractive than new dot patterns (Halberstadt & Rhodes, 2000; Langlois & Roggman, 1990; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006). Thus, multiple versions of a stimulus itself can be shown across exposure, and the stimulus on which those versions are based gains in pleasantness as a result.

A similar analysis can be made of the structural mere exposure effect (see Figure 1d). Gordon and Holyoak (1983) asked participants to memorize a series of consonant strings with recurring letter combinations that were generated by a finite-state grammar. In a test phase, participants were presented with novel strings that contained only familiar combinations of letters (grammatical) and novel strings that contained novel combinations of letters (non-grammatical). Participants preferred strings that contained only familiar combinations of letters (grammatical) to those that contained novel combinations of letters (non-grammatical). Thus, exposure to parts of a target stimulus across different occasions is enough to observe a mere exposure effect (see also Dulany, Carlson, & Dewey, 1984; Newell & Bright, 2001).

Overall, the beauty-in-averageness effect and the structural mere exposure effect show that the identical stimulus need not be shown on exposure and test. Parts of the stimulus can be new, as long as they are sufficiently similar to exposed stimuli (beauty-in-averageness effect), and other parts of the stimulus can be exposed with other stimuli (structural mere exposure effect). These two phenomena appear to stand in contrast with de Zilva et al.'s (2013) demonstration of the context specificity of the mere exposure effect. Thus, it seems that some exposure-test changes allow the mere exposure effect to generalize, but others do not. The current paper seeks to resolve this issue.

An influential theory, which allows for some exposure-test changes, suggests that pleasantness is a function of the consistency between the target stimulus and an activated schema or cognitive prototype (Gaver & Mandler, 1987; Mandler, 1984; Winkielman, Huber, Kavanagh, & Schwarz, 2012). According to the theory, a target stimulus that is consistent with an activated schema seems familiar since the mental structures used to comprehend the target stimulus already exist. Thus, integration of the target stimulus into the schema increases the familiarity of the target stimulus and results in a positive evaluation. A small variation to this account would suggest that the integration of the target stimulus into the schema increases the fluency or speed of processing of the target stimulus (Jacoby & Dallas, 1981) and results in a positive evaluation (Reber et al., 2004; Whittlesea, 1993; Whittlesea & Williams, 2001). A target stimulus that is not successfully integrated into a schema seems less familiar (or is less fluent) and is evaluated negatively.

The schema theory is able to accommodate increased liking to target stimuli even after exposure-test changes that occur in the beauty-in-averageness effect and the structural mere exposure effect. Although the identical stimulus need not be shown on exposure and on test for these two phenomena, the exposure and test stimuli are similar in the two cases. In the beauty-in-averageness effect, the physical properties of the prototype dot patterns presented on test are relatively consistent with the physical properties of the distorted dot patterns (which could comprise a schema). In the structural mere exposure effect, test letter strings have a structure of stimulus components (letter pairs) that is consistent with exposed letter strings (which could also comprise a schema). It is reasonable to suggest that that these test stimuli can be integrated into their respective schemas because of their similarity to the exposed stimuli. According to this account, the target stimuli would be both familiar and evaluated positively, which is indeed the case (Dulany et al., 1984; Halberstadt & Rhodes, 2000; Newell & Bright, 2001; Winkielman et al., 2006).

If the schema theory is applicable to the mere exposure effect (as well as to the beauty-in-averageness effect and the structural mere exposure effect), there should be situations in which the mere exposure effect is observed following exposure-test changes. Perhaps the crucial determinant of liking after exposure-test changes is the degree to which those changes occur across exposure. In both the structural mere exposure effect and the beauty-in-averageness effect, subtle stimulus changes occur within the exposure session as well as between exposure and test. However, in de Zilva et al.'s (2013) context-specific mere exposure finding the pairs of nonsense word cues (contexts) and target face stimuli did not change across exposure; thus the changes in the stimulus occurred for the first time at test. Perhaps when the target stimulus is exposed in a single context (i.e. no changes across exposure), the mere exposure effect will not generalize to other contexts, because the schema established across exposure includes only one word–face pair. In contrast, when exposure to the target stimulus is divided across multiple contexts, there are two obvious possibilities: multiple-context exposure might disrupt the mere exposure effect because none of the word–face pairs are especially familiar on test, or multiple-context exposure might allow the mere exposure effect to generalize to multiple contexts because a schema is established for multiple word–face pairs.

Following from this line of research, in the current experiments target stimuli were repeatedly exposed in a single context or repeatedly exposed across multiple contexts. In Experiments 1–2, the target stimuli were then tested in the exposure context (or one of the exposure contexts) or in a familiar but different context. Experiments 1–2 also tested different levels of consistency between the context and the target stimulus, indexed by their frequency of exposure together during the exposure phase. Experiment 3 compared target stimuli that had been exposed in a single context to those that had been exposed in multiple contexts with the test context removed. This was to demonstrate that any differences in liking between stimuli exposed in a single context and those exposed in multiple contexts were due not to the exposure contexts alone but, rather, to the interaction between the exposure context and the test context.

EXPERIMENT 1

In each experiment, a context and a target stimulus were presented at each exposure trial. A nonsense word cue took the role of the context, and a photograph of a face took the role of the target stimulus. In the exposure phase, participants were encouraged to learn which nonsense word (described as a name) went with which face (see Figure 2 for an example). There were eight exposure trials for each name and for each face. For each target stimulus, the exposure trials were either in a single context or across multiple contexts. In the single-context condition, the nonsense words and faces that comprised the pairs were consistent across all eight exposures. In the multiple-context condition, the nonsense words and faces that comprised the pairs changed, such that each face was presented with two different names and each name was presented with two different faces. Single-context

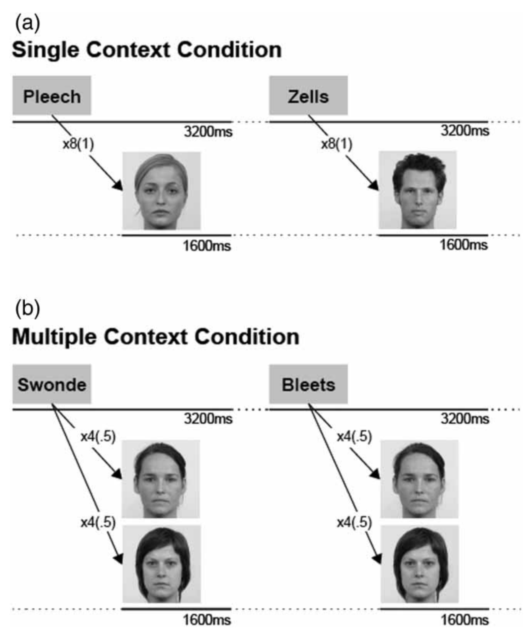

Figure 2. *Exposure conditions of Experiment 1. In the single-exposure-context condition, faces were presented with the same name on all eight exposures. Those names were never presented with another face. In the multiple-exposure-context condition, faces were presented with one name for four exposures and with a different name for another four exposures (fully randomized). Similarly, each multiple-context name was presented with one face for four exposures and with another face for four exposures. The arrows show the frequency of exposure to each pair and the probability of each face given the name in brackets.*

trials and multiple-context trials were intermixed throughout the exposure phase.

In addition to single-context and multiple-context exposure conditions, the word–face pairs were manipulated on test into intact, rearranged, and novel pairs (as in de Zilva et al., 2013). Intact pairs refer to familiar nonsense word cues and familiar target faces that were previously exposed together. Rearranged pairs refer to familiar nonsense word cues and familiar target faces that had not been exposed together. Novel refers to familiar nonsense word cues and novel target faces.

Consistent with the findings of de Zilva et al. (2013), it was expected that for single-context exposure, target faces presented with the same nonsense word as in exposure (intact) would be preferred to both novel target faces (novel) and to target faces presented with different nonsense words (rearranged), with no difference between the latter two. If changes across exposure aid generalization of the mere exposure effect as outlined above, the same pattern should emerge for the multiple-context condition. This would be the case even though the frequency of exposure to the word–face pair in the multiple-context condition is half that in the single-context condition.

Method

Participants

Thirty-six undergraduate students (10 male, 25 female, 1 undisclosed; mean age 19 years) from the University of New South Wales volunteered for the experiment in return for course credit. The number of participants was pre-determined and was slightly larger than our previous work (de Zilva et al., 2013) in order to have sufficient power to detect interactions between experimental factors.

Stimuli and apparatus

The target stimuli were 36 grey-scale 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, & Coltheart, 2002). Not all of the experiments used all 36 faces and words; however, the experiments randomly sampled from the same stimulus pool. The photographs were 6.7 cm × 10.2 cm in size. The nonsense words were presented above the location of the faces on a mid-grey rectangle, which measured 6.7 cm × 2.2 cm. The stimuli were presented centrally on a 17″ LCD computer monitor (1280 × 1024 resolution; 60-Hz refresh rate), and their presentation was controlled by Livecode 5.5.

Design and procedure

The experiment consisted of an exposure phase and then a test phase. Each participant was randomly allocated a sample of stimuli from the stimulus pool, which were in turn randomly allocated to one of two exposure conditions: single-context exposure or multiple-context exposure. Crossed with this factor at test, the single-context exposure stimuli and the multiple-context exposure stimuli were randomly assigned to intact, rearranged, and novel test conditions.

Twelve faces and twelve nonsense words were given single-context exposure (see Row 1 of Figure 2). For single-context exposure, each nonsense word was paired with one face (and each face with one nonsense word) across all eight exposures, and thus the predictive validity of the face given the nonsense word equalled 1 ($P[face_a|name_a] = 1$). Another twelve faces and twelve nonsense words were given multiple-context exposure (see Row 2 of Figure 2). For multiple-context exposure, each nonsense word was paired with two faces (and each face with two nonsense words). Thus, the predictive validity of the face given the nonsense word was .5 ($P[face_a|name_a] = .5$). Each pair was repeated four times, so that there were eight exposures to each nonsense word and to each face.

Exposure trials proceeded as follows. The nonsense word cue appeared alone for 1600 ms, after which the target face appeared on screen with the nonsense word for a further 1600 ms. Thus, each trial lasted 3200 ms. The nonsense word and the target face were removed simultaneously at the end of the trial. There was a 500-ms inter-trial interval. Each nonsense word and each target face was presented eight times across eight blocks (once each block). The word–face pairs in each block were presented in randomized order, and thus the single-context trials and the multiple-context trials were intermixed. To encourage participants to pay attention, they were told that the nonsense words were names, and that they should try to remember the names and faces that were presented together. They were told that some names belonged to multiple people and that some people had multiple names.

The test phase followed immediately after the exposure phase. Of the twelve single-context-exposure nonsense words and faces, four were randomly allocated to the intact test condition, four were randomly allocated to the rearranged test condition, and four were allocated to the novel test condition (although only the names were used). The twelve multiple-context -exposure nonsense words and faces were similarly allocated to the intact, rearranged, and novel test conditions. Thus, eight nonsense words and faces were presented in each of the intact, rearranged, and novel test conditions. In the intact condition, a familiar face was presented with a familiar nonsense word with which the face had been previously exposed. For faces that had single-context exposure, this meant that the face had been presented with the nonsense word on all eight occasions. For faces that had multiple-context exposure, this meant that the face was presented with a nonsense word with which it had four of its eight exposures. In the rearranged condition, a familiar face was presented with a familiar nonsense word with which the face had never been exposed. For faces that had single-context exposure, this meant that the face was presented with a nonsense word that had been presented with one different face for all eight exposures. For faces that had multiple-context exposure, this meant that the face was presented with a nonsense word that had been presented with two different faces across its eight exposures. In the novel condition, novel faces were presented with a familiar nonsense word. For the single-context-exposure–novel-test condition, the face was presented with a nonsense word that had been presented with one different face for all eight exposures. For the multiple-context-exposure–novel-test condition, this meant that the face was presented with a nonsense word that had been presented with two different faces across its eight exposures. Thus, four test faces were in each of the following six conditions for which pleasantness ratings were taken: single context intact, single context rearranged, and single context novel; multiple context intact, multiple context rearranged, and multiple context novel.

On test trials, the nonsense word cue appeared alone for 1600 ms, followed by the target face for a further 1600 ms. After that time participants made their responses on a sliding scale from 1 (highly unpleasant) to 100 (highly pleasant). Following the participant's response, there was a 500-ms inter-trial interval.

Results and discussion

To investigate the effect of changes to the context across exposure and between exposure and test on the pleasantness of target faces, we calculated the mean rating for single-context and multiple-context exposure for each of intact, rearranged, and novel relationships (Figure 3). The pattern for faces in both the single-context and multiple-context exposure conditions appears to be similar —intact faces appear to be rated more pleasant than rearranged and novel faces.

Statistical analyses confirmed these impressions. Averaged across the three test conditions we found no difference between faces given single-context exposure and multiple-context exposure, $F(1,35) = .11$, $MSE = 79.85$, $p = .74$, $d = .08$. Averaged across single-context and multiple-context exposure, intact faces were rated as more pleasant than novel faces, $F(1,35) = 17.58$, $MSE = 471.66$, $p < .01$, $d = 1.00$. Rearranged faces were liked more than novel faces, $F(1,35) = 6.70$, $MSE = 129.44$, $p = .01$, $d = .62$. Importantly, intact faces were rated as more pleasant than rearranged faces, $F(1,35) = 8.47$, $MSE = 448.07$, $p < .01$, $d = .70$. These results were similar for single-context exposure and

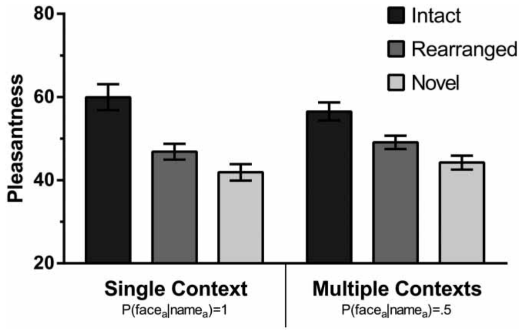

Figure 3. *Mean pleasantness ratings and standard error of the means (± SEM) in Experiment 1. Single-context faces (left) were presented with the same name on all eight exposures. Multiple-context faces (right) were presented with one name for four exposures and with a different name for another four exposures. On test, the faces were presented in intact, rearranged, or novel pairs. Intact refers to familiar faces that were presented in the same context as exposure (the word–face pair was previously exposed). Rearranged refers to familiar faces that were presented in a familiar context (with a familiar word), but one in which the face had not been previously exposed. Novel refers to novel faces that were presented in a familiar context (with a familiar word).*

multiple-context exposure. There was no significant difference between single-context exposure and multiple-context exposure for intact and novel faces, $F(1, 35) = 3.32$, $MSE = 91.47$, $p = .08$, $d = .44$, for intact and rearranged faces, $F(1, 35) = 2.42$, $MSE = 85.74$, $p = .13$, $d = .37$, or for rearranged and novel faces, $F(1, 35) < 0.01$, $MSE = 122.20$, $p = .98$, $d = .01$.

Experiment 1 replicated and extended de Zilva et al.'s (2013) finding that changes in context between exposure and test remove the mere exposure effect. The pattern was observed regardless of whether the target stimulus had been exposed in a single context or in multiple contexts. The results also show that the mere exposure effect is robust to certain context changes. It appears that when a target stimulus is exposed consistently in a single context, the mere exposure effect is observed only in that context. However, when a target stimulus is exposed in multiple contexts, the mere exposure effect is observed in each of those contexts. Thus, the mere exposure effect can be robust to changes that occur across exposure.

EXPERIMENT 2

In the multiple-context condition in Experiment 1, the occurrence of a particular target stimulus given the context was relatively frequent and predictable ($P[face_a|name_a] = .5$). Thus, the schema theory suggests that the association between the face and the schema should be strong. Conversely, if the frequency and predictability of a target stimulus given the context is sufficiently low, the association between the face and the schema should be weak. Thus, in these conditions, the mere exposure effect might be disrupted. The novel aspect of this hypothesis is that the mere exposure effect would be disrupted by changes to the context that occur across exposure. Experiment 2 investigates this hypothesis. It was again expected that in the single-context condition, target faces presented with the same nonsense word as in exposure (intact) would be preferred to novel target faces (novel) and target faces presented with different nonsense words (rearranged). However, in the multiple-context condition—when the occurrence of a particular target stimulus given the context is relatively infrequent and unpredictable—the mere exposure effect would be lost regardless of the test context.

Method

Thirty-six undergraduate students (12 male, 23 female, 1 undisclosed; mean age = 19 years) from the University of New South Wales volunteered for the experiment in return for course credit. Participants who completed Experiment 1 were excluded from Experiment 2. The method was identical to Experiment 1, except for a decrease to the frequency of exposure to multiple-context word–face pairs and the associated decrease in predictive validity of the nonsense word (see Row 2 of Figure 4). Thus, in the multiple-context condition, each nonsense word was paired with eight faces (and each face with eight nonsense words); therefore the predictive validity of the face given the nonsense word equalled .125 ($P[face_a|name_a] = .125$). Single-context exposure was the same as in

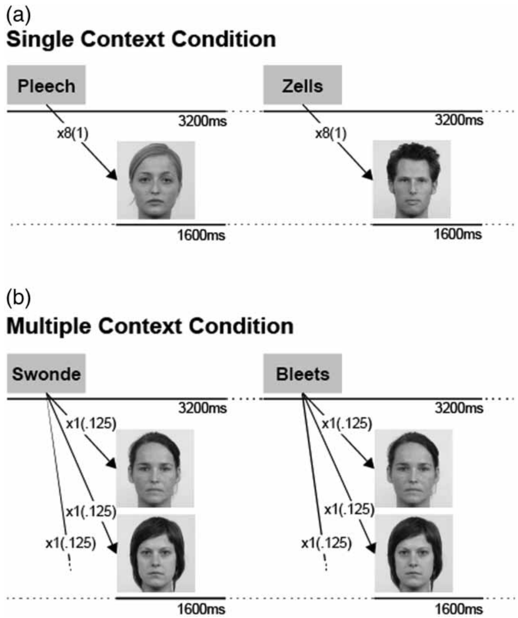

Figure 4. *Exposure conditions of Experiments 2–3. In the single-exposure-context condition, faces were presented with the same name on all eight exposures. Those names were never presented with another face. In the multiple-exposure-context condition, faces were presented with a different name on each of eight exposures, and similarly, each name was presented with a different face on each of eight exposures. The arrows show the frequency of exposure to each pair and the probability of each face given the name in brackets.*

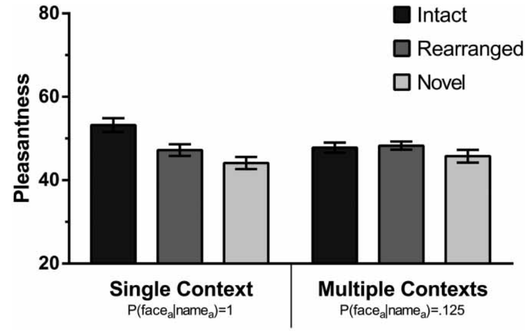

Figure 5. *Mean pleasantness ratings and standard error of the means (± SEM) in Experiment 2. Single-context faces (left) were presented with the same name on all eight exposures. Multiple-context faces (right) were presented with a different name on each of eight exposures. On test, the faces were presented in intact, rearranged, or novel pairs.*

Experiment 1. To accommodate the requirement for a different context on each exposure in the multiple-context condition, 16 target faces and nonsense words were allocated to the condition (rather than 12, as in Experiment 1).

Results and discussion

The mean pleasantness ratings for intact, rearranged ,and novel target stimuli that were given single-context or multiple-context exposure are shown in Figure 5. With one exception—higher ratings for single-context intact faces—the means of the different conditions were numerically very similar.

As in Experiment 1, averaged across the three test conditions we found no difference between single-context and multiple-context faces, $F(1,35) = .62$, $MSE = 69.04$, $p = .44$, $d = .19$. Averaged across single-context and multiple-context exposure, intact faces were rated as more pleasant than novel faces, $F(1,35) = 7.26$, $MSE = 155.19$, $p = .01$, $d = .64$; however, rearranged faces were liked no more than novel faces, $F(1,35) = 1.86$, $MSE = 153.61$, $p = .18$, $d = .33$. Intact faces were rated as more pleasant than rearranged faces, $F(1,35) = 4.24$, $MSE = 65.42$, $p = .05$, $d = .49$.

The above main effects are qualified by interactions with the exposure conditions. These can be attributed to relatively high ratings for faces that were given single-context exposure and presented in an intact name–face pair on test. The difference between intact and novel faces was greater when faces had been presented in a single context compared to multiple contexts, $F(1,35) = 7.70$, $MSE = 57.36$, $p < .01$, $d = .66$. Furthermore, simple effects show that for single-context exposure, intact faces were more pleasant than novel faces $F(1,35) = 10.92$, $MSE = 136.39$, $p < .01$, $d = .79$, but for multiple-context exposure, intact faces were liked no more than novel faces, $F(1, 35) = 1.47$, $MSE = 79.54$, $p = .23$, $d = .29$. Similarly, the difference between intact and rearranged faces was greatest when faces had been given single-context exposure, $F(1,35) = 7.37$, $MSE = 51.07$, $p = .01$, $d = .65$. Intact faces were more pleasant than rearranged faces only when the faces had been given single-context exposure, $F(1,35) = 8.90$, $MSE = 72.95$, $p = .01$, $d = .71$. There was no difference in pleasantness of intact faces and rearranged faces when the faces were given multiple-context exposure, $F(1,35) = .09$, $MSE = 43.53$, $p = .76$, $d = .07$. There was no interaction between the exposure context conditions for rearranged and novel faces, $F(1,35) = .09$, $MSE = 30.78$, $p = .77$, $d = .07$.

The main finding of Experiment 2 suggests that when the association between the target stimulus and the test context is relatively weak, the mere exposure effect for the target stimulus is lost. The weak association between the target stimulus and the test context, and subsequent loss of the mere exposure effect, came about through changes to the context of the target stimulus across exposure. In contrast, the loss of the mere exposure effect in Experiment 1 came about through changes to the context between exposure and test. Thus, Experiment 1 and Experiment 2 together suggest that the strength of the association between the target stimulus and the test context determines whether the target stimulus is liked in that context.

An alternative interpretation of the main finding of Experiment 2 is that the multiple-context exposure itself, not the subsequent weak association between the target stimulus and the test context, removed the mere exposure effect. Following this logic, there should be no circumstances in which the mere exposure effect is observed when the occurrence of a particular target stimulus given the context is relatively infrequent and unpredictable across exposure. Experiment 3 seeks to rule out this alternative interpretation.

EXPERIMENT 3

To disentangle two interpretations of our results, we removed the test context in order to isolate the effects of exposure in a single context and exposure in multiple contexts. If the disruption to the mere exposure effect in the multiple-context condition in Experiment 2 took place during exposure, the mere exposure effect should again be disrupted. If the strength of the association between the target stimulus and the test context was the cause of the disruption to the mere exposure effect, then we should observe the mere exposure effect for both the single and multiple-context conditions because the effects of a test context have been removed or at least minimized.

Method

Twenty-four undergraduate students (7 male, 17 female; mean age = 20 years) from the University of New South Wales volunteered for the experiment in return for course credit. Participants in Experiments 1–2 were not eligible for Experiment 3. The method was very similar to Experiment 2, except that the nonsense word cues were omitted from the test phase and thus target faces from the single-exposure-context condition and the multiple-context condition were presented alone. Eight faces and eight nonsense words were given single-context exposure (see Row 1 of Figure 4), and another eight faces and eight nonsense words were given multiple-context exposure (see Row 2 of Figure 4). As in the multiple-context condition in Experiment 2, each nonsense word was paired with each of the eight faces (and each face with each of the eight nonsense words), one for each exposure trial. At test, the eight faces given single-context exposure, the eight faces given multiple-context exposure, and eight novel faces were presented alone (i.e. without nonsense words). Participants rated the pleasantness of the faces from 1 (highly unpleasant) to 100 (highly pleasant). All other aspects of the method were identical to those of Experiment 2.

Results and discussion

To investigate the effect of exposure context on the pleasantness of target stimuli, we compared the mean ratings for faces that were presented in a single context across exposure, presented in multiple contexts across exposure, and novel faces (Figure 6). The exposed faces, whether they had been presented in a single context or in multiple contexts, were rated more pleasant than novel faces [$F(1, 23) = 9.43$,

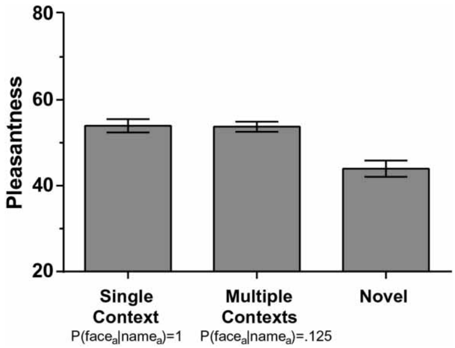

Figure 6. *Mean pleasantness ratings for faces exposed in a single context, for faces exposed in multiple contexts, and for novel faces in Experiment 3. Error bars indicate standard error of the means (± SEM). Single-context faces were presented with the same name on all eight exposures. Multiple-context faces were presented with a different name on each of eight exposures.*

$MSE = 126.89$, $p < .01$, $d = .91$; $F(1, 23) = 12.39$, $MSE = 92.27$, $p < .01$, $d = 1.04$, respectively]. Thus, the mere exposure effect was replicated. The mean ratings for single-context and multiple-context faces were numerically very similar and not significantly different from each other, $F(1, 23) = .01$, $MSE = 47.65$, $p = .91$, $d = .03$.

The pattern suggests that the mere exposure effect is robust to changes in context across exposure. Familiar faces were preferred to novel faces, and the effect was equally strong regardless of whether the faces were exposed with a single nonsense word (single context) or with multiple nonsense words (multiple contexts). Combined with Experiment 2, the result favours the interpretation that the mere exposure effect is disrupted when the association between the target stimulus and the context is relatively weak at test.

GENERAL DISCUSSION

The present study suggests that the pleasantness of a stimulus is partly determined by the frequency of its past exposure in the context in which the stimulus is finally evaluated. Consistent with de Zilva et al. (2013), the mere exposure effect was observed when the target stimulus was presented in a context in which it had been repeatedly exposed. The mere exposure effect is also seen when the target stimulus is exposed in other contexts (and the context is exposed with other target stimuli), though only under particular circumstances. When a target stimulus' eight exposures are divided between two contexts, the target stimulus is relatively pleasant in both of those contexts, but it is not pleasant in a familiar but different or new context (Experiment 1, multiple-context condition). When a target stimulus' exposures are divided between eight contexts, the target stimulus is no more pleasant than a novel stimulus, regardless of the context in which it is presented (Experiment 2, multiple-context condition). One exception, however, is that the impact of the context seems to be expressed only when an explicit context is also present at test. When there is no experimenter-defined context (i.e. no nonsense word cue) on test, participants prefer familiar target stimuli, even when exposure is divided between many contexts (Experiment 3).

What seems to be required for the mere exposure effect is a high level of consistency between the exposure contexts and test contexts because repeated exposure in few contexts permits the mere exposure effect, but minimal exposure in many contexts does not. While consistency is a broad framework to investigate numerous cognitive and social psychology phenomena, the source of consistency could help to provide a mechanism for the contextually dependent mere exposure effect. Thus, to explain our results, we turn to two potential sources of consistency in the current experiments: (1) the simple frequency of exposure to two components presented together and (2) the predictability of one component given another component.

A simple account of the observed effects suggests that the familiarity of the relationship between contexts and target stimuli affects the pleasantness of target stimuli. The target stimuli that were relatively liked had been shown repeatedly in their test context, and thus not only were the target stimuli familiar, but so was the relationship between the contexts and the target stimuli. The account suggests that familiarity of the context–

target pair presented on test is then misattributed to the pleasantness of the target stimulus. Similar misattributions of familiarity to liking and other psychological constructs are prevalent in the literature (Bornstein & D'Agostino, 1994; Mandler, Nakamura, & Van Zandt, 1987; Unkelbach, 2007). In contrast, target stimuli that were relatively disliked were those that had not been repeatedly shown in their test context. In this case, the novelty of the relationship between the target stimulus and the contexts is unpleasant and is misattributed to the target stimulus. An exception is when the target is presented without an explicit context (Experiment 3); we return to this below.

The account above suggests that the relationship between contexts and target stimuli needs to be exposed, just as the target stimuli themselves do. Sufficient exposure to target stimuli and contexts together provides consistency, fluency, and, in turn, liking. One more specific version of this explanation is that the consistent context allows participants to predict which face will appear—which, therefore, primes the target face and allows it to be processed more fluently. In the current study, context–target familiarity and the predictability of the target stimulus given the context are correlated. These two accounts, therefore, generate the same predictions. There are other reasons, however, to challenge an account of these data based on predictability.

To expand on a predictability account, a target stimulus that had been exposed in only two contexts will be more easily predicted in one of those contexts than a target stimulus that had been exposed in eight contexts. The expectation of the target given the context will be greater in the former than the latter case. Furthermore, there is separate evidence that a moderate expectancy for a target stimulus increases the size of the mere exposure effect compared to a weak expectancy (Whittlesea & Williams, 2001). However, de Zilva et al. (2013), argue that expectancies are not the mechanism for context-specific mere exposure effects. In an experiment described in brief in de Zilva et al. (2013), participants' ability to generate an expectation of the target stimulus on the basis of the context was manipulated either by presenting (at test) the context and the target stimulus simultaneously or by presenting the target stimulus after a delay. The idea was for the context to allow an expectation of the target stimulus to arise in the delay condition, but not in the immediate condition. This experiment replicated the mere exposure effect when the target stimulus was presented in the same context as exposure and failed to replicate the effect when the target stimulus was presented in a familiar but different context (as seen in the current Experiment 1). Importantly, however, the timing of the target stimulus with respect to the context had no reliable impact on the size of this mere exposure effect. While not definitive, this pattern argues against the idea that the predictability of a target stimulus determined its pleasantness in the present experiments; the target stimulus could be predicted prior to its presentation in the delay but not the immediate condition, and this manipulation did not affect pleasantness ratings. These data are, however, consistent with the idea that the familiarity of the context–target pair determined pleasantness ratings.[2]

The idea that consistency between components is affectively positive has been raised in connection with cognitive prototypes or schemas (Gaver & Mandler, 1987; Mandler, 1984; Winkielman et al., 2012). According to these theories, test stimuli for which schemas exist are preferred to stimuli for which there is no schema in memory. In the present study, exposure could lead to representation of each name and face in memory as well as a representation of each name–face pair (similar to a schema). On test trials, for example in Experiment 3, exposed faces presented without a name will be preferred to novel faces because the exposed faces will match a representation of that face in memory. The data from Experiments 1–2 seem to demand additionally that when both

[2]The experiment referred to here is described in Footnote 2 of de Zilva et al. (2013). Full details of this experiment are available from the authors.

the name and the face are presented on test, and ratings of the face are required, participants are unable to rate the face alone. That is, liking is determined by the match between the name–face pair as a whole and name–face schemas in memory. This would explain why intact name–face pairs are preferred to rearranged pairs.

For this schema explanation to apply to all of the current data, one would need to assume that in the multiple-context exposure condition in Experiment 2, participants were unable to encode the very large number of face–name pairs in memory (unable to create eight schemas). When those name–face pairs were presented on test, although they had been presented in the study phase, they were not liked because they did not match any schema in memory. Overall, therefore, preference was shown for stimuli that matched items or item pairs (schemas) in memory. Interestingly, although participants were asked in Experiment 1 and 2 to rate a specific part of the test stimulus (the face), they involuntarily rated the entire stimulus–context configuration.

Turning to some practical implications of the present work, much research that investigates the benefits of exposure—for example in exposure therapy (Siegel & Weingerger, 2012) and in advertising (Stafford & Grimes, 2012)—is based on experiments in which exposure and evaluation take place in the same context. The results of the present work corroborate suggestions that many estimates of the utility of exposure in therapy and in advertising are likely to be overly optimistic. For example, a phobic client's evaluation of a stimulus following exposure in the clinic is likely to be much more positive in the clinic than in another environment. Indeed, research on extinction of fear responses in humans (Neumann, Lipp, & Cory, 2007; Rodriguez, Craske, Mineka, & Hladek, 1999) and in rats (Bouton & Ricker, 1994; but see Lovibond, Preston, & Mackintosh, 1984) shows that the fear responses decline across exposure, but the fear responses are renewed when tested in a new or a familiar but different context (for a review, see Hermans, Craske, Mineka, & Lovibond, 2006). Even when exposure occurs in multiple contexts, renewal of fear responses is no more resistant to context changes (Bouton, Garcia-Gutierrez, Zilski, & Moody, 2006; Neumann et al., 2007).

There are also implications for advertising, which often uses dramatically different exposure and evaluation contexts. For example, the benefits of exposure in advertisements that place products in idealized scenes such as an exotic location might not transfer to an ordinary "point of sale" context such as a supermarket. The present work suggests that for the maximal benefit of exposure, the context of exposure should ideally be the evaluation context (for example via in-store advertising) or should at least attempt to replicate or simulate the evaluation context. Of course, there may be other reasons to expose stimuli in idealized scenes—for example, to condition preferences (Baker, 1999; Stuart, Shimp, & Engle, 1987). However, such contexts reduce the likelihood that the positive effects of exposure will transfer to evaluation contexts. Furthermore, the effects of mere exposure and conditioning potentially work against each other. To condition a preference, the target stimulus is paired with a valued outcome that is not present on test. The present work, on the other hand, suggests that changing the cues (and potentially outcomes) paired with a target stimulus can disrupt preferences. It is therefore desirable to know in any given context whether the conditioning effect is stronger than the mere exposure effect or vice versa.

Previous evidence has suggested that the mere exposure effect is generally a robust phenomenon in human (Bornstein, 1989; de Zilva et al., 2013; Newell & Shanks, 2007) and non-human animals (Hill, 1978). In contrast, the present work finds that the mere exposure effect is highly specific to contexts in which the target stimulus has been repeatedly exposed. It suggests that simple familiarity of the target stimulus may be insufficient for the mere exposure effect; familiarity of the relationship between the target stimulus and other stimuli with which it is presented on test (here the name context) is also critical.

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